NATIONAL REPORT OF CHINA
on the Transboundary Diagnostic Analysis
(TDA)
Appendix

South China Institute of Environmental Sciences, MEE

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1 Appendix of Socioeconomics and Climate-related Threats

1.1 Data sources

Category	Data	Source
Public database and statistical platform	Demographics (such as population and density)	Derived from websites such as citypopulation.de, globaldatalab.org, and data.stats.gov.cn, etc.
	Human development index（HDI）	
	Added value of sector, higher education, agriculture, industrial and fishery production, etc.	
Regional yearbook and government data	Population data of each city	Based on the statistical bulletins and annual reports of the national and regional economic and social development over the years, as well as the data released by the statistical departments
	Gross Domestic Product（GDP）	
Special reports and research data	Marine industry composition	Annual monitoring and evaluation report on the operation of the marine economy in Nanhai District
	Climate-related threats	Annual bulletin on marine disasters in Nanhai Nistrict

1.2 Metadata

The data mainly include information about the time range, geographical scope, statistical unit, and calculation method of the indicators:

Population data: From 2000 to 2024 (statistical data is segmented for some years, such as 2000, 2005, 2010, 2020, 2024, and 2022 for each city).

HDI data: From 1990 to 2022, covering calculated according to the standard method of the United Nations Development Programme (UNDP), integrating life expectancy, education level, and income indicators.

Economic data (GDP, industrial added value): From 2018 to 2023 (some indicators up to 2024), GDP and industrial added value are mainly expressed in 100 million yuan.

Population: The natural growth rate is calculated using the formula "birth rate - death rate".

Research area: Guangdong, Guangxi and Hainan provinces/regions.

1.3 Assessment methods

This chapter mainly employs descriptive analysis, time series analysis, and horizontal comparison analysis.

1.4 Data appendix

Appendix 1.4-1 Population（Unit: Ten Thousand）

Time	China	Guangdong	Guangxi	Hainan
2000	126743	8642	4489	787
2005	130756	9194	4660	828
2010	134091	10441	4610	869
2020	138326	12624	5019	1012
2024	141212	12780	5013	1048

Data source: CityPopulation.de. 2024

Appendix 1.4-2 Human Development Index

TIME	Guangdong	Guangxi	Hainan	National
1990	0.537	0.450	0.503	0.482
1995	0.582	0.502	0.542	0.532
2000	0.629	0.547	0.585	0.586
2005	0.689	0.603	0.637	0.643
2010	0.734	0.661	0.688	0.698
2015	0.769	0.703	0.735	0.741
2020	0.807	0.742	0.774	0.781
2022	0.813	0.751	0.781	0.788
2023	0.823	0.760	0.790	0.797

Average annual HDI growth	1990-2000	2000-2010	2010-2022	1990-2023
	1.22	1.19	1.14	1.65

Data source: Global Data Lab

Appendix 1.4-3 Residents' discretionary income in 2024

Per capita disposable income (Yuan)	China	Guangdong	Guangxi	Hainan
Average	41314	51474	31125	34829
Urban	54188	61629	43044	44307
Rural	23119	26729	19954	22146

Data source: National Bureau of Statistics, 2025

Appendix 1.4-4 National Residents' Expenditure in 2024 (Unit: Yuan)

category	Expenditure	percent	category	Expenditure	percent
Food and beverages	8411	29.8%	Transportation and Communication	3976	14.1%
Clothing	1521	5.4%	Education, Culture and Entertainment	3189	11.3%
Living quarters	6263	22.2%	Healthcare	2547	9.0%
Daily necessities and services	1547	5.5%	Other Goods and Services	773	2.7%

Data source: National Bureau of Statistics, 2025

Appendix 1.4-5 Situation of Higher Education

Higher education	Region	2020	2021	2022	2023
Number of higher education institutions	China	2738	2756	2760	2822
	Guangdong	154	160	161	162
	Guangxi	82	85	85	87
	Hainan	21	21	21	22
Number of students enrolled in higher education institutions (10,000 persons)	China	3285.294	3496.130	3659.417	3775.014
	Guangdong	240.02	253.98	267.09	260.14
	Guangxi	118.42	132.1	140.75	148.32
	Hainan	23.01	24.51	25.81	27.26
Total number of faculty and staff in higher education institutions (10,000 persons)	China	266.8708	275.1229	284.2993	291.9989
	Guangdong	17.79	19.03	19.81	20.57
	Guangxi	8.23	7.84	8.42	8.77
	Hainan	1.79	1.93	2.03	2.13

Data source: National Bureau of Statistics, 2025

Appendix 1.4-6 Gross Domestic Product (Unit: Billions Yuan)

Time	China	Guangdong	Guangxi	Hainan
2024	1349083.5	141633.8	28649.4	7935.7
2023	1294271.7	137905.4	27501.7	7590.2
2022	1234029.4	132547.1	26419.7	6912.8
2021	1173823.0	127577.4	25311.5	6508.9
2020	1034867.6	113708.9	22250.7	5640.8
2019	1005872.0	110468.1	21341.5	5442.1

Data source: National Bureau of Statistics, 2025

Appendix 1.4-7 Added Value of Agriculture, Industry and Services (Unit: Billion Yuan)

Region	Time	Agriculture	Industry	Service
Guangdong	2018	3836.4	41398.5	54710.4
	2019	4350.6	43368.2	60268.1
	2020	4732.7	43868.1	62550.8
	2021	4984.7	50555.8	69179
	2022	5350.1	52620.7	71542.7
	2023	5540.7	54437.3	75695.2
Guangxi	2018	3021.1	6692.9	9913.9
	2019	3389.7	7046.4	10801
	2020	3645.9	7046.8	11428.1
	2021	4051.3	8513.9	12643.9
	2022	4270.4	8819.3	13096.3
	2023	4468.2	8924.1	13810.1
Hainan	2018	986	1053.1	2871.6
	2019	1079	1083.8	3168.1
	2020	1136	1072.2	3358
	2021	1254.4	1240.8	4008.8
	2022	1417.9	1308.7	4163.1

Region	Time	Agriculture	Industry	Service
	2023	1507.4	1448.5	4595.3

Data source: National Bureau of Statistics, 2025

Appendix 1.4-8 Composition of the marine industry in the South China Sea

Types of marine industries	percen	Types of marine industries	percen
Marine tourism industry	42.70%	Marine power industry	1.20%
Marine transportation industry	14.30%	Marine shipbuilding industry	1.00%
Marine fishing industry	13.30%	Seawater desalination and comprehensive utilization industry	1.00%
Marine oil and gas industry	10.10%	Marine aquatic product processing industry	0.80%
Marine chemical industry	10.10%	Marine drugs and biological products industry	0.70%
Marine engineering construction industry	3.00%	Marine mining industry	0.10%
Marine engineering equipment manufacturing industry	1.60%		

Data Source: South China Sea Bureau of the Ministry of Natural Resources of the People's Republic of China, 2025

Appendix 1.4-9 Agricultural Production

Region	Grain planting area (10^3 ha)	Grain Yield (10^4 tons)	Total Output Value (100 million yuan)
China	118970	69541	158507.2
Guangdong	2229.51	1285.19	9202.09
Guangxi	2834.7	1395.36	6983.53
Hainan	273.59	147.02	2410.33

Data source: National Bureau of Statistics, 2025

Appendix 1.4-10 Industrial Production

Province	Indicator	2024	2023	2022	2021	2020
Guangdong	Raw salt (10^4 tons)		1.44	1.76	2.99	4.38
	Refined sugar (10^4 tons)		103.4	124.89	134.13	126.02
	Beer (10^4 tons)		454.46	394.11	408.25	357.46
	Cigarettes (10^9 pieces, 10^4 cases)		1302.28	1296.5	1291.5	1278.37
	Cloth (10^9 meters)	16.2	16.3	21.17	27.17	20.71
	Machine-made paper and paperboard (10^4 tons)		2509.21	2374.14	2410.29	2435.96
	Coke (10^4 tons)	746.71	767.45	735.35	619.81	596.98
	Sulfuric acid (100% equivalent) (10^4 tons)		260.86	237.38	251.57	229.43
	Caustic soda (100% equivalent) (10^4 tons)		34.73	33.98	34.56	33.16
	Soda ash (sodium carbonate) (10^4 tons)		64.56	55.66	57.28	54.39
	Ethylene (10^4 tons)		501.57	391.15	417.75	365.68
	Agricultural nitrogen, phosphorus, and potassium fertilizers (10^4 tons)	17.4	12.8	6.42	7.77	11.3
	Chemical pesticide raw materials (10^4 tons)		3.84	3.1	2.28	1.98
	Primary form of plastics (10^4 tons)		946.19	813.35	839.81	713.44

Province	Indicator	2024	2023	2022	2021	2020
	Chemical fibers (10^4 tons)		71.85	75.51	84.71	67.15
	Cement (10^4 tons)	13074.2	14251.58	15226.37	17084.27	17165.52
	Flat glass (10^4 boxes)	10685.2	8931.64	10474.56	11119.85	10027.52
	Pig iron (10^4 tons)	2345.2	2437.57	2420.9	2053.64	2158.74
	Crude steel (10^4 tons)	4043.4	4448.54	3571.77	3178.33	3382.34
	Steel (10^4 tons)	6294.9	6192.39	5627.44	5111.18	4866.19
	Metal cutting machines (10^4 units)		17.19	8.69	8.21	5.48
	Automobiles (10^4 units)	570.7	518.3	415.37	338.46	313.29
	Cars (thousand units)		269.74	235.02	190.23	172.7
	Household refrigerators (10^4 units)	2617.8	2195	1773.35	2091.56	2305.76
	Room air conditioners (10^4 units)		7438.47	6637.7	6736.25	6714.61
	Household washing machines (10^4 units)		785.56	686.72	757.57	741.57
	Mobile communication handheld devices (10^4 units)	68260.9	65066.15	62690.03	66965.36	61951.12
	Microcomputers (10^4 units)	7681.8	7458.1	6948.85	5935.41	4621.58
	Integrated circuits (10^4 pieces)		6978000	5168700	5393900	3735744.8
	Color televisions (10^4 units)		11211.09	10792.02	9810.91	11233.36
Guangxi	Raw salt (10^4 tons)					3.85
	Refined sugar (10^4 tons)		622.14	735.83	702.74	677.03
	Beer (10^4 tons)		117.28	113.75	116.5	111.84
	Cigarettes (10^9 pieces, 10^4 cases)		720.98	718.14	716.44	706.71
	Cloth (10^9 meters)	0.5	0.33	0.85	0.82	0.39
	Machine-made paper and paperboard (10^4 tons)		656.87	558.05	336.22	313.38
	Coke (10^4 tons)	1221	1300.96	1084.79	1071.81	811.82
	Sulfuric acid (100% equivalent) (10^4 tons)		486.18	463.43	432.84	444.1
	Caustic soda (100% equivalent) (10^4 tons)		121.14	90.28	86.56	82.37
	Agricultural nitrogen, phosphorus, and potassium fertilizers (10^4 tons)	38.7	27.8	43.8	41.22	47.71
	Chemical pesticide raw materials (10^4 tons)		8.2	2.17	2.9	3.11
	Primary form of plastics (10^4 tons)		101.65	50.81	40.1	28.6
	Cement (10^4 tons)	9492.8	9999.99	10419.98	11432.02	12129.05
	Flat glass (10^4 boxes)	3515.9	3333.54	3556.42	3561.34	2650.24
	Pig iron (10^4 tons)	3862.6	3401.97	3013.35	3015.29	1457.14
	Crude steel (10^4 tons)	4342.8	3816.57	3793.23	3660.88	3452.23
	Steel (10^4 tons)	5590.9	5236.5	4995.56	5282.09	4731.16
	Metal cutting machines (10^4 units)		0.12	0.13	0.14	0.11
	Large and medium-sized tractors (10^4 units)		0.09	0.16	0.09	
	Automobiles (10^4 units)	110.8	97.52	177	190.08	174.49
	Cars (thousand units)		45.69	61.38	47.41	23.8
	Household refrigerators (10^4 units)		205.88	416.76	176.02	99.38

Province	Indicator	2024	2023	2022	2021	2020
	Room air conditioners (10^4 units)		386.36	767.56	121.08	
	Household washing machines (10^4 units)		227.63	614.28	160.75	141.11
	Mobile communication handheld devices (10^4 units)	1864.2	2266.06	2644.6	2337.94	1504.9
	Microcomputers (10^4 units)	160.4	173.36	179.69	224.27	185.05
	Integrated circuits (10^4 pieces)		160100	107200	60000	2021
	Color televisions (10^4 units)		573.05	579.66	807.07	670.91
Hainan	Raw salt (10^4 tons)			3.74	4.41	5.62
	Refined sugar (10^4 tons)		7.22	9.79	8.88	11.43
	Beer (10^4 tons)		2.02	2.94	4.17	3.38
	Cigarettes (10^9 pieces, 10^4 cases)		117	119	116	115
	Machine-made paper and paperboard (10^4 tons)		187.37	191.04	181.98	174.95
	Agricultural nitrogen, phosphorus, and potassium fertilizers (10^4 tons)	66.8	65.45	63.66	67.04	65.25
	Chemical pesticide raw materials (10^4 tons)		1.74	0.31	4.28	0.19
	Primary form of plastics (10^4 tons)		107.47	25.51	33.14	34.87
	Chemical fibers (10^4 tons)					
	Cement (10^4 tons)	1458.1	1545.43	1626.36	1937.52	1838.85
	Flat glass (10^4 boxes)	842.8	1146.84	832.83	470.35	424.67
	Automobiles (10^4 units)	1.1	3.02	2.2	1.48	0.13
	Mobile communication handheld devices (10^4 units)	0.1	0.47			

Data source: National Bureau of Statistics, 2025

Appendix Table 1.4-11 Gross Output Value of Fisheries

(Unit: Billion Yuan)

Time	China	Guangdong	Guangxi	Hainan
2018	12131.51	1383.81	504.29	387.44
2019	12572.38	1524.78	538.93	390.9
2020	12775.88	1581.54	508.3	390.8
2021	14507.24	1747.34	555.06	435.16
2022	15467.97	1898.24	575.8	466.61
2023	16116.2	2005.31	583.01	523.04

Data source: National Bureau of Statistics, 2025

2 Appendix of the Land-Based Pollution

2.1 Key Water Quality Indicators for Coastal Waters of the three Southern Maritime Provinces

Average Concentrations of Inorganic Nitrogen and Active Phosphate in Coastal Waters of the three Southern Maritime Provinces

（Unit: mg/L）

Year	Inorganic Nitrogen			Active Phosphate		
	Guangdong	Guangxi	Hainan	Guangdong	Guangxi	Hainan
2020	0.290	0.083	0.054	0.014	0.009	0.006
2021	0.272	0.092	0.042	0.013	0.010	0.006
2022	0.290	0.081	0.038	0.014	0.009	0.004
2023	0.251	0.130	0.039	0.011	0.012	0.006
2024	0.286	0.104	0.028	0.012	0.011	0.004

Data source: Public data from the website of the Ministry of Ecology and Environment of the People's Republic of China.

Total Nitrogen Pollution Load in the Pearl River Estuary

（Unit: tons）

Year	Cities within Guangdong Province in the Pearl River Estuary Basin -Total Nitrogen Discharge to Sea	Hong Kong and Macao -Total Nitrogen Discharge to Sea	Total
2020	186970.3	60135	247105.4
2022	159925.9	60154.7	220080.6

Data source: Calculation esults from the South China Institute of Environmental Sciences, MEE.

2.2 Wastewater Discharge of the three Southern Maritime Provinces, 2010~2023

Year	Wastewater Discharge（Unit: 100 million tons）				COD Discharge（Unit: 10,000 tons）				Ammonia Nitrogen Discharge（Unit: 10,000 tons）				Total Nitrogen Discharge（Unit: 10,000 tons）				Total Phosphorus Discharge（Unit: 10,000 tons）			
	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan
2010	72.3	72.3			85.8	85.8			10.7	10.7										
2011	79.48	79.48			188.45	188.45			23.09	23.09										
2012	83.85	83.85			180.29	180.29			22.42	22.42										
2013	86.25	86.25			173.39	173.39			21.64	21.64										
2014	154.72	90.51	21.93	42.28	373.33	167.06	74.4	131.87	32.65	10.82	7.93	13.9			11.43	42.72	6.49		1.41	5.08
2015	156.51	91.15	22.01	43.35	360.53	160.69	71.12	128.72	41.07	19.97	7.67	13.43			11.42	42.66	6.45		1.4	5.05
2016	153.36	93.83	19.32	40.21	158.35	96.42	30.55	31.38	19.36	14.39	2.26	2.71	11.15		4.24	6.91	0.73		0.38	0.35
2017	88.2	88.2			161.58	100.09	32.64	28.85	18.59	13.75	2.29	2.55	10.85		4.29	6.56	0.68		0.37	0.31
2018	90.4	90.4			156.34	97.17	32.17	27	18.39	13.65	2.44	2.3	11.05		4.7	6.35	0.62		0.37	0.25
2019					121.4	63.48	32.73	25.19	9.01	4.48	2.47	2.06	24.24	13.18	4.7	6.36	1.28	0.69	0.39	0.2
2020					408.92	161.31	103.04	144.57	21.52	9.64	7.25	4.63	69.42	29.11	22.92	17.39	7.05	3.06	2.36	1.63
2021					405.75	158.08	95.82	151.85	17.37	7.72	5.32	4.33	65.88	28.82	19.43	17.63	7.08	2.96	2.33	1.79
2022					440.09	161.85	93.44	184.8	16.95	7.51	4.78	4.66	67.9	29.5	19.43	18.97	7.49	3.05	2.29	2.15
2023					188.07	188.07			11.63	11.63			30.46	30.46			3.63	3.63		

Data source: Environmental Statistical Bulletins of Guangdong, Guangxi, and Hainan.

2.3 Aquaculture of the three Southern Maritime Provinces, 2008~2023

（Unit: ha）

Year	Total Aquaculture Area(Unit: Hectares)			Total Mariculture Area(Unit: Hectares)			Total Freshwater Aquaculture Area(Unit: Hectares)		
	Guangdong	Guangxi	Hainan	Guangdong	Guangxi	Hainan	Guangdong	Guangxi	Hainan
2023	477345	216356	42946	172133	69075	14673	305212	147281	28273
2022	473655	200997	44957	166596	67393	15594	307059	133604	29363
2021	476708	194694	45034	166805	64255	15881	309903	130439	29153
2020	474096	186062	44665	164719	52277	17595	309377	133785	27070
2019	478212	183193	51737	164990	49822	20510	313222	133371	31227
2018	478897	183302	52172	165614	47844	21372	313283	135458	30800
2017	473771	181966	61101	161690	47022	31715	312081	134944	29386
2016	555149	238617	55480	196065	54720	17823	359084	183897	37657
2015	565678	239150	54728	194861	55015	17138	370817	184135	37590
2014	564989	236163	53914	193691	54233	16691	371298	181930	37223
2013	570137	231665	57898	197198	54001	16791	372939	177664	41107
2012	575210	229096	56341	201834	53249	15845	373376	175847	40496
2011	573914	225719	54994	203410	52212	14646	370504	173507	40348
2010	563411	221669	54207	199258	51287	14529	364153	170382	39678
2009	562158	217827	53464	194766	50670	15247	367392	167157	38217
2008	544251	209394	42086	189717	47380	12983	354534	162014	29103

Data source: *China Fishery Statistical Yearbook (2008~2024)*.

2.4 Direct Discharge of the three Southern Maritime Provinces, 2010~2023

Year	Direct Discharge Wastewater Volume (Unit: 10,000 tons)				Direct Discharge Ammonia Nitrogen (Unit: tons)				Direct Discharge Total Nitrogen (Unit: tons)				Direct Discharge Total Phosphorus (Unit: tons)			
	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan	Total	Guangdong	Guangxi	Hainan
2010	105463	78139	7682	19642	5331	2722	460	2149					451.9	57.4	195.6	198.9
2011	96000	69000	8000	19000	3400	2000	400	1000					999.3	499.4	324.1	175.8
2012	96400	66000	9400	21000	3600	2000	600	1000					948.7	484.1	358.9	105.7
2013	132000	71000	37000	24000	3700	1200	1100	1400					951.9	480.8	364.9	106.2
2014	111700	69400	16500	25800	4300	1500	1300	1500					1051.8	399.1	491.8	160.9
2015	101800	61200	12900	27700	3400	1200	1300	900					885.7	299.1	449.3	137.3
2016	105521	67030	10730	27761	1744	874	349	521	8713	4551	1416	2746	768	333	343	92
2017	111834	71487	11901	28446	1844	1014	289	541	10395	6008	1630	2757	626	328	205	93
2018	123722	84815	10109	28798	2158	1507	125	526	10662	6849	1337	2476	512	293	136	83
2019	174499	123669	19827	31003	2011	1110	427	474	11892	7863	1740	2289	506	275	150	81
2020	136019	81563	19760	34696	1373	616	357	400	10280	5359	1815	3106	793	181	532	80
2021	148070	91188	20177	36705	1249	505	174	570	10313	5687	1506	3120	262	132	46	84
2022	164174	106372	16472	41330	1165	576	132	457	10754	6504	1340	2910	272	148	42	82
2023	160987	105894	14425	40668	1356	732	100	524	12016	7893	1099	3024	267	165	23	79

Data source: *Environmental Statistical Yearbooks of Guangdong, Guangxi, and Hainan (2010~2023)*

2.5 Fertilizer Application of the three Southern Maritime Provinces, 2012~2022

（Unit: 10,000 tons）

Year	Guangdong	Guangxi	Hainan	Total
2012	245.4	249	45.5	539.9
2013	243.9	255.7	47.6	547.2
2014	249.6	258.7	49.5	557.8
2015	256.5	259.9	51.1	567.5
2016	261	262.1	50.6	573.7
2017	258.3	263.8	51.4	573.5
2018	231.3	255	48.4	534.7
2019	225.8	252	46.3	524.1
2020	219.8	247.9	42.6	510.3
2021	212.9	251.9	40.8	505.6
2022	208.7	249.2	38.6	496.5

Data source: *China Statistical Yearbook on Environment (2012~2022)*.

2.6 Environmental and Social Impacts of Land-Based Pollution and Marine Litter

1. Impacts of Land-Based Pollution

The environmental impacts of land-based pollution mainly include the following aspects: Firstly, it causes water quality degradation. After land-based pollutants enter the sea, they lead to excessive levels of nutrients such as nitrogen and phosphorus. High nutrient loads cause hypoxia and reduced water transparency, resulting in decreased biodiversity (Lv et al., 2016). Secondly, it triggers marine ecological disasters. Imbalances in nutrient structure induce algal blooms, which can cause fish mortality, threaten seafood safety, and even alter the structure and function of ecosystems.

Land-based pollution may affect industries such as fisheries, aquaculture, and tourism. Its socio-economic impacts mainly include: loss of aesthetic value, where water turbidity and red tides causing water discoloration create visual pollution; losses in fisheries and aquaculture, where harmful algal blooms lead to reduced fishery yields; and threats to human health from consuming contaminated seafood.

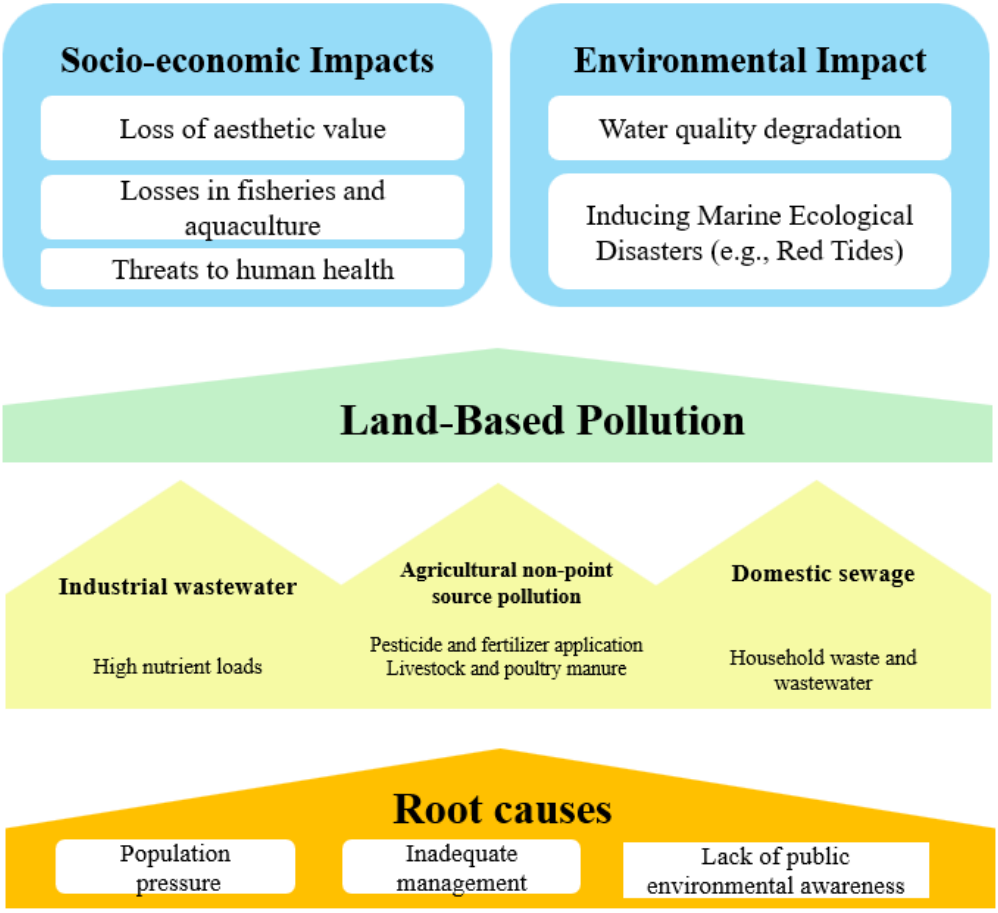

Figure 2.6-1 Impacts and Root causes of Land-based Pollution Issues

2. Impacts of Marine Litter

The environmental impacts of marine litter mainly include the following aspects: harm to marine life, where abandoned fishing gear entangles and lacerates marine animals; damage to habitat environments, where marine litter, driven by currents and tides, scours and damages live corals; and health risks posed by microplastics, which can adsorb heavy metals and persistent organic pollutants on their surfaces, are ingested by plankton, fish, and other organisms, allowing the pollutants to bioaccumulate through the food chain and threaten high-trophic-level species.

Marine litter may affect industries such as fisheries, coastal tourism, and shipping. Its socio-economic impacts mainly include: loss of aesthetic value, where beach litter and floating debris in coastal tourist areas damage the marine ecological landscape and create visual pollution; fishery losses, where ingested microplastics cause stunted growth, reduced feeding rates, and impaired reproductive capacity in marine fishery

organisms (Wang, 2021); threats to human health, as microplastics may transfer to seafood directly consumed by humans; and hazards to navigation and maritime safety when marine litter entangles ship propellers.

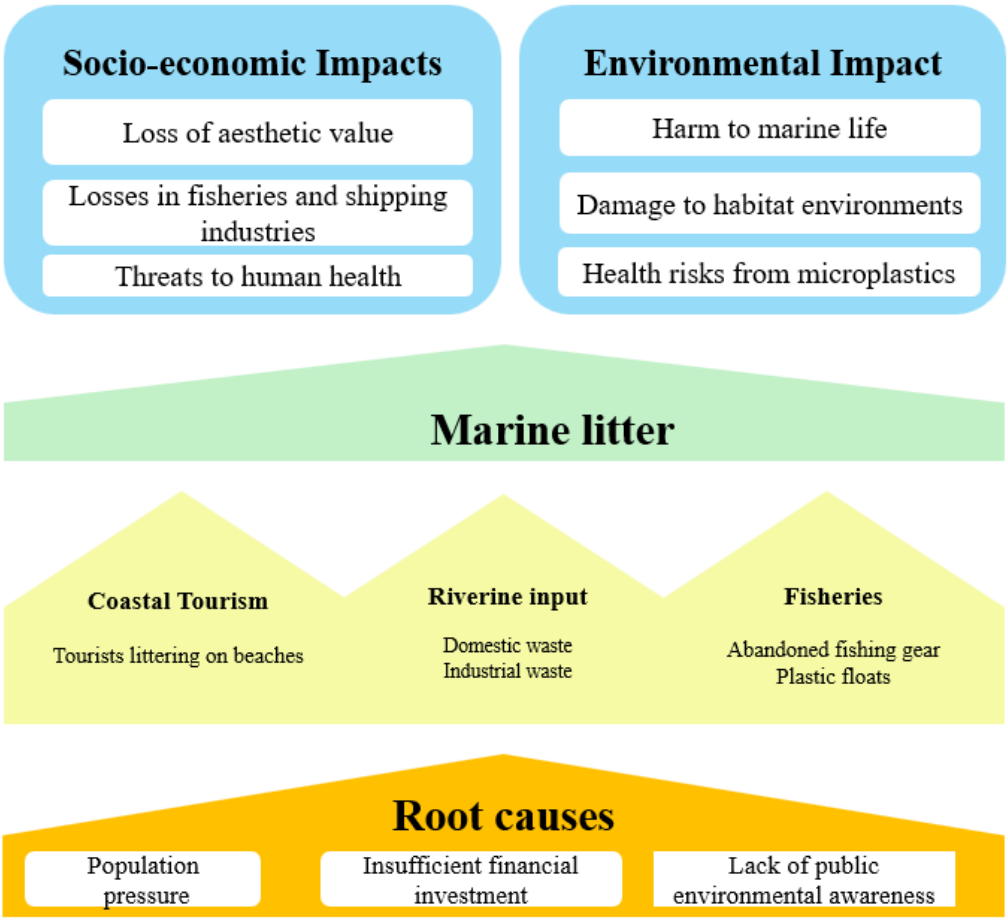

Figure2.6-2 Impacts and Root causes of Marine Litter Issues

2.7 Analysis of Aquaculture Management Practices

First, optimizing the spatial layout of mariculture. Guangdong Province has released the *Guangdong Province Modern Marine Ranching Development Master Plan (2024-2035)* , with fully integrating various planning and control requirements such as Territorial Spatial Master Plan, Marine Functional Zoning, Aquaculture Waters and Tidal Flat Zoning Plan, Urban Development Boundary, Ecological Conservation Red Line, and Maritime Transportation Zones, so as to scientifically plan the spatial layout of aquaculture zones. The Guangxi Zhuang Autonomous Region issued the *Guangxi Aquaculture Waters and Tidal Flat Zoning Plan (2021-2030),* formulated a marine ranching development plan, and expanded marine aquaculture space. It planned the spatial scope and development directions for marine ranching areas across the region to form a development pattern that coordinates nearshore/shallow sea and offshore/deep-sea areas. Hainan Province issued the *Hainan Aquaculture Waters and Tidal Flat Zoning Plan (2018-2030)*, proposed optimizing the spatial layout of aquaculture, deepening the development of ecological fisheries, vigorously building a tropical aquatic seed industry, actively developing smart fisheries, strengthening the ecological environment management of aquaculture waters, and effectively enhancing scientific and technological support capabilities.

Second, issuing effluent discharge standards. Guangdong, Guangxi, and Hainan have respectively issued the *Aquaculture Effluent Discharge Standard (DB44/ 2462-2024), Mariculture Effluent Discharge Standard (DB45/T 2841-2024)*, *Aquaculture Effluent Discharge Standard (DB46/475-2023)*. By establishing these standards, monitoring and supervision mangement are specified, urging regulatory departments and aquaculture enterprises to enhance the monitoring of aquaculture effluent discharge. Through strengthened law enforcement and supervision of aquaculture pollution, aquaculture enterprises are prompted to fulfill their primary responsibility for pollution prevention, supporting the green and healthy development of the aquaculture industry.

Third, strengthening aquaculture effluent treatment and technical guidance. At the national level, the *Several Opinions on Accelerating the Green Development of Aquaculture* was issued, making arrangements for developing ecological and healthy

aquaculture. To address the pressing issues in ecological aquaculture, special projects have been established within the National Key R&D Program for scientific and technological research. Additionally, the "Five Major Actions" for the nationwide promotion of green and healthy aquaculture technologies are continuously implemented, focusing on extending ecological aquaculture models such as multi-trophic integrated aquaculture and integrated rice-fish farming, thereby guiding the transformation of aquaculture practices.

Guangdong Province has successively issued documents such as the *Recommended Models for Comprehensive Treatment Technology of Aquaculture Effluent in Guangdong Province (First Edition)* and the *Models and Typical Cases for Comprehensive Treatment Technology of Aquaculture Effluent in Guangdong Province (2025 Edition)*, guiding various regions to promote comprehensive treatment of aquaculture effluent based on local conditions and facilitating the resource utilization or compliance discharge of aquaculture effluent. Additionally, the Pearl River Delta Million-Mu Aquaculture Pond Upgrade and Transformation Action has been launched.

Guangxi Zhuang Autonomous Region issued the *Guidelines for the Construction of Ecological Treatment Facilities for Aquaculture Effluent in Guangxi (Trial)* and the *Implementation Plan for the Five Major Actions of Promoting Green and Healthy Aquaculture Technology in Guangxi*. Relying on 60 national-level backbone bases, the region is demonstrating and promoting ecological and healthy aquaculture models throughout its administrative area, respectively implementing the five major actions: promoting ecological healthy aquaculture models, promoting aquaculture effluent treatment models, reducing the use of aquaculture drugs, substituting compound feed for juvenile trash fish, and improving the quality of the aquatic seed industry.

Hainan Province issued the Guiding Opinions on Promoting the Green Development of the Aquaculture Industry, vigorously promoting ecological, circular, and carbon-sink farming models such as recirculating aquaculture systems, integrated

multi-trophic polyculture of fish, shrimp, crabs, shellfish, and algae, large-water-surface ecological enhancement aquaculture, integrated rice-fish farming, and aquaponics. It also promotes the technology for converting pond sediment into organic fertilizer and develops marine ranching. The province has launched the water purification and water maintenance through fisheries initiative, aiming to purify the water quality of lakes, reservoirs, rivers, and sea areas, and restore the aquatic ecological environment by enhancing the cultivation of filter-feeding, herbivorous, and omnivorous fish, as well as shellfish and algae.

3 Appendix of Ecosystems

This chapter provides scientific support for marine ecological conservation, resource utilization, and management decision-making by systematically reviewing the current status of key coastal wetland ecosystems, identifying important coastal biodiversity areas, and analyzing the critical issues and changing trends faced by coastal wetlands. In line with the relevant framework of the SCS Phase II Project, the key coastal wetland habitats covered in this chapter mainly include three major categories: mangroves, seagrass beds, and other significant coastal wetlands. Here, "other significant coastal wetlands" refer to offshore and coastal wetlands other than mangroves, seagrass beds, and coral reefs, primarily encompassing estuarine waters and shallow marine waters.

3.1 Ecosystems local indicators

Mangrove

Shankou

Properties and Variables	**Data & Information needed**
Geographic information	
Name of area	Shankou site
Co-ordinates	109°37′00″~109°47′00″E, 21°28′22″~21°37′00″N
Total area	8000 ha
Areas of mangrove forest	797 ha
Area of tidal flats	
Area of seagrass beds	
Social & use information	
Ownership	Most are owned by Guangxi Shankou Mangrove Ecosystem Nature Reserve, and the rest by Guangxi Province.
Management regime	1.Measures of the Guangxi Zhuang Autonomous Region for the Administration of the Shankou Mangrove Ecological Nature Reserve and the Beilun Estuary National Nature Reserve (Institutionalizing integrated ecological protection and restoration) 2. Central government allocated CNY 4.14 million for invasive Spartina alterniflora control ang Total CNY 76.69 million invested in wetland conservation and restoration in 2022.
Current use	Protected area, science popularization and education base
Potential use	Blue Carbon sink, scientific research
Significance/national importance	The area has been designated into the national-level nature reserves.
Protection status	Total area 8,000 ha: core area 824 ha, buffer zone 3,600 ha, experimental area 3,576 ha.
Biological data	
Present status	In 2023, both the area of mangroves and their average density increased compared with the previous year.
Natural/Managed	78.17

Properties and Variables	**Data & Information needed**
Mangrove diversity	12 true mangrove species (including 2 alien plant species) and 8 semi-mangrove species.
Seagrass diversity	
Migrating species	*Grus leucogeranus*、*Larus saundersi*
SCS Endemic species	——
Endangered or threatened species (IUCN criteria)	*Grus leucogeranus*（National first-class protected bird species）、*Larus saundersi*（National First-Class Protected Wild Animals）
Source & sink of larvae	——
Stress-pressure information	
Intrinsic/internal sources of change	interspecific competition
Extrinsic/external sources of change	Typhoon, mangrove replanting, exotic species invasion,
Rates of change, historical review	mangrove area :75.55 ha(2018), 79.26 ha(2023). Mangrove coverage: 69.6% (2019), 91.1% (2023). Mangrove Density: 66.8 plants/100 m² (2019), 63.2 plants/100 m² (2023).
Social and economic drivers of change in environmental state	Population growth, urbanization.
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Dongzhaigang

Properties and Variables	**Data & Information needed**
Geographic information	
Name of area	Dongzhaigang site
Co-ordinates	19 ° 52′48″~20° 0′59″N，110° 32′7″~110° 38′4″E
Total area	3337.6 ha
Areas of mangrove forest	1771 ha
Area of tidal flats	1759.4 ha
Area of seagrass beds	
Social & use information	
Ownership	Most are owned by Hainan Dongzhai Port Mangrove National Nature Reserve, and the rest by Hainan Province.
Management regime	1.Master Plan for Hainan Dongzhaigang National Nature Reserve (2022-2031). 2. Decision on Strengthening the Protection and Management of Dongzhaigang Mangrove Wetlands. 3.Master Plan for Haikou Dongzhaigang Tourist Area (2012-2030). 4.Dongzhaigang Community Co-management Plan.
Current use	Eco-education base, scientific research
Potential use	Biodiversity conservation，blue carbon
Significance/national importance	The area has been designated into the national-level nature reserves and.
Protection status	Total area 3,337.6 ha: core area 1,503.33 ha, buffer zone 1,359.72 ha, experimental area 474.55 ha.
Biological data	
Present status	The ecological environment of Dongzhaigang Reserve has shown a marked positive trend, with its ecological environment status rated as Grade I and its conservation effectiveness assessment graded as "Excellent" in 2017-2022.
Mangrove diversity	36 mangrove species belonging to 20 families in Dongzhai Harbor (8 of which are unique to Hainan).
Seagrass diversity	
Migrating species	*Ardeola bacchus*、*Limosa limosa*、*Northern Shoveler*、*Anarhynchus mongolus*、*Charadrius leschenaultii*、*Common Greenshank*、*Common Redshank*
SCS Endemic species	
Endangered or threatened species (IUCN criteria)	
Source & sink of larvae	
Stress-pressure information	
Intrinsic/internal sources of change	1. Interspecific competition intensifies the survival pressure on rare and endangered species. 2.Local species like *Sphaeroma* and *Derris* have erupted in population, occupying habitats
Extrinsic/external sources of change	Tourism, urbanization, typhoon, mangrove replanting
Rates of change, historical review	From 2009 to 2021, the variety of mangrove plants in the protected area gradually increased. From 17 families and 27 species in 2009 to 20 families, 25 genera and 36 species in 2019; the area of mangrove wetlands increased from 1,696.98 ha in 2017 to 1,767.67 ha in 2021. From 2015 to 2022, the number of monitored bird species rose from 85 to 135; from 2017 to 2021, the coverage of natural forests increased from 51.26% to 53.44%, the proportion of natural wetland area rose from 96.67% to 98.71%, and the retention rate of natural shorelines

Properties and Variables	**Data & Information needed**
	increased from 43.33% to 46.31%.
Social and economic drivers of change in environmental state	Population growth, urbanization
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	-
Values of indirect use	-
Values from environmental services	-
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Zhanjiang

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Zhanjiang site
Co-ordinates	109°40′~110°35′E, 20°14′~21°35′N
Total area	20278.8 ha
Areas of mangrove forest	7228 ha
Area of tidal flats	
Area of seagrass beds	
Social & use information	
Ownership	Most are owned by Guangdong Zhanjiang Mangrove National Nature Reserve, and the rest by Guangdong Province.
Management regime	1.Master Plan for zhanjiang National Nature Reserve. 2.Regulations on the Protection of Zhanjiang Mangrove Wetlands. 3.Administrative Measures for Guangdong Zhanjiang Mangrove National Nature Reserve
Current use	Reserve, eco-education base, scientific research, internationally important wetland
Potential use	Popular science education、blue carbon
Significance/national importance	Incorporated into the national-level nature reserve and ecological conservation red line, the Ramsar International Important Wetland.
Protection status	With a total area of 20,278.8 ha, including 7,228 ha of mangroves, it is China's largest mangrove nature reserve.
Biological data	
Present status	Overall excellent in main protected objects、ecosystem structure、ecosystem services and water environment quality.
Natural/Managed	
Mangrove diversity	True mangrove and semi-mangrove plants15 families26 species
Seagrass diversity	
Migrating species	*Eurynorhynchus pygmeus*、*Ciconia boyciana*、*Thalasseus bernsteini*、*Larus relictus*、*Platalea minor*、*Larus saundersi*
SCS Endemic species	
Endangered or threatened species (IUCN criteria)	*Platalea minor*
Source & sink of larvae	-
Stress-pressure information	
Intrinsic/internal sources of change	Species competition and succession, such as the invasive alien plant *Spartina alterniflora* has encroached on habitats; the proportion of the alien species *Sonneratia apetala* is high; the habitat of *Derris trifoliata* overlaps with that of some mangrove plants; and the rare and endangered mangrove plants have a small distribution area and small population size.
Extrinsic/external sources of change	Landscape fragmentation.
Rates of change, historical review	The area of mangroves increased from 4,333.5 hectares in 2020 to 7728 hectares in 2024.
Social and economic drivers of change in environmental state	Population growth, urbanization.
Economic valuation (based on Barbier, E.B. 1997)	
Values of direct use	
Values of indirect use	
Values from environmental	

Properties and Variables	Data & Information needed
services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Huidong

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Huidong site
Co-ordinates	114.33° ~ 115.26°E,22.30° ~ 23.23°N
Total area	3014.6 ha
Areas of mangrove forest	667 ha
Area of tidal flats	
Area of seagrass beds	
Social & use information	
Ownership	Partially state-owned and partially collective-owned
Management regime	1.Huizhou Mangrove Wetland Protection Special Plan (2024-2030), 2.Implementation Plan for Huidong County Kaozhouyang 10,000-mu Mangrove Demonstration Zone
Current use	Eco-education base, tourism, biodiversity conservation, windbreak and wave dissipation, silt promotion and beach protection
Potential use	Blue Carbon、popular science education
Significance/national importance	-
Protection status	Huizhou has 667 ha of mangrove waters and 2,060 ha of coastal tidal flats.
Biological data	
Present status	There are 9 species of true mangrove plants, 6 species of semi-mangrove plants, and 29 species of mangrove associated plants.
Natural/Managed	1.13
Mangrove diversity	
Seagrass diversity	-
Migrating species	*Egretta garzetta, Egretta garzetta, Ardea cinerea,Ardea alba, Ardea alba, Ardea alba, Anas crecca, Anas poecilorhyncha*
SCS Endemic species	-
Endangered or threatened species (IUCN criteria)	-
Source & sink of larvae	-
Stress-pressure information	
Intrinsic/internal sources of change	Invasive mangrove plants significantly affect the growth of mangrove plants by climbing up their canopies and forming a covering.
Extrinsic/external sources of change	Artificial reclamation for aquaculture, coastal urban development and construction, mangrove restoration
Rates of change, historical review	N.A.
Social and economic drivers of change in environmental state	Population growth, urbanization
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Yangjiang

Properties and Variables	**Data & Information needed**
Geographic information	
Name of area	Yangjiang site
Co-ordinates	111°16'35"~112°21'51"E,21°28'45"~22°41'02"N
Total area	796600 ha
Areas of mangrove forest	973.68 ha
Area of tidal flats	11042.75 ha
Area of seagrass beds	
Social & use information	
Ownership	Partially state-owned and partially collective-owned
Management regime	1. Yangjiang Forestry Protection and Development 14th Five-Year Plan. 2. Master Plan for National Forest City Development in Yangjiang, Guangdong. 3. Measures for the Administration of Guangdong Yangdong Shouchang River Mangrove National Wetland Park
Current use	Tourism, fishery breeding
Potential use	Blue Carbon、dyke reinforcement
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	
Biological data	
Present status	The main tree species include *Avicennia marina*, *Kandelia obovata* , and *Aegiceras corniculatum*. In recent years, newly planted species include true mangrove varieties such as *Rhizophora stylosa* and *Bruguiera gymnorrhiza* , as well as semi-mangrove varieties like *Cerbera manghas* , *Syzygium aqueum*, *Heritiera littoralis* , and *Barringtonia racemosa*.
Natural/Managed	5
Mangrove diversity	N.A.
Seagrass diversity	N.A.
Birds,Migrating species	*Numenius arquata*、*Platalea minor*、*Eurynorhynchus pygmeus*、*Egretta garzetta*
SCS Endemic species	
Endangered or threatened species (IUCN criteria)	
Source & sink of larvae	
Stress-pressure information	
Intrinsic/internal sources of change	N.A
Extrinsic/external sources of change	Population growth, urbanization, aquaculture
Rates of change, historical review	N.A.
Social and economic drivers of change in environmental state	Population growth, urbanization,
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	

Properties and Variables	Data & Information needed
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Seagrass bed

Xincun Seagrass Bed

Parameter	Data & Information needed
Geographic informtion	
Name of area	Xincun, Lingshui, Hainan(lagoon)
Co-ordinates	109.5831°N，18.2430°E
Area of coral reefs	NA
Area of seagrass beds	301 ha
Reef type	NA
Environmental state information	
Present status	The average coverage, density and biomass of seagrass are 9.9%, 775.11 shoots/m^2, and 23.47 g/m^2 respectively.
Present threats	Sediment accumulation at lagoon mouth: the hydrodynamic conditions in the lagoon are weak.
	Land based pollution: domestic sewage from surrounding villages and restaurants in tourist scenic areas.
Trends of change	The coverage and density of seagrass increased in 2023 compared to 2021.
Future threats	No data
Social & use information	
Ownership	Special Marine Protected Area for Seagrass in Xincun Port and Li'an Port of Lingshui
Management regime	Within the demonstration area, there is “Special Marine Protected Areas for Seagrass in Xincun Port and Li'an Port of Lingshui”. The area is managed and protected in accordance with the "Marine Special Protected Area Management Regulations", "Lingshui Xincun Port and Li'an Port Seagrass Special Protected Area Management Regulations", and "Lingshui Xincun Port and Li'an Port Seagrass Special Protected Area Construction and Management Plan". In the protected areas, resource surveys were conducted, and their plans were integrated with the "Overall Planning of Hainan Xincun Port and Li'an Port Seagrass Special Protected Area (2023-2035)" and "Hainan Natural Protected Area Integration and Optimization Plan". According to the integration and optimization results of natural protected areas, the 1,314.24 ha of Xincun Port area in the protected area have been integrated into the Hainan Lingshui National Wetland Park. Lingshui Li Autonomous County has issued and implemented the Xincun Port Mangrove (Wetland) Restoration Project.
Current use	Special Marine Protected Area
Traditional use	Agriculture, fisheries and tourism
Potential use	Scientific research and natural education
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The total area of Special Marine Protected Area for Seagrass in Xincun Port and Li'an Port of Lingshui is 2,320 ha, with Xincun Port's seagrass area covering approximately 301 ha.
Biological data	
Species diversity	5 species of seagrass, the coverage ranges from 0% to 41.59%
SCS Endemic species	NA
Endangered or threatened species (IUCN criteria)	*Chelonia mydas*
Source & sink of larvae	No data
Migratory species	*Ardea*、*Spodiopsar sericeus*, *Spatula querquedula*, *Himantopus himantopus*, *Platalea leucorodia*, etc.

Parameter	Data & Information needed
Economic valuation (based on Barbier, E.B. 1997)	
Extractive	No data
Non extractive (tourism)	No data
Total Economic Value	No data

Li’an Seagrass Bed

Parameter	Data & Information needed
Geographic informtion	
Name of area	Li’an, Lingshui, Hainan(lagoon)
Co-ordinates	110.0226°E，18.2534°N
Area of coral reefs	NA
Area of seagrass beds	114 ha
Reef type	NA
Environmental state information	
Present status	The average coverage, density and biomass of seagrass are 10.8%, 248 shoots/m^2, and 50.54 g/m^2 respectively.
Present threats	Sediment accumulation at lagoon mouth: the sand spits on of the lagoon entrance have developed, obstructing the tidal channel and causing poor tidal flow.
	Land based pollution: domestic sewage from coastal villages, pond aquaculture wastewater.
Trends of change	The coverage and density of seagrass increased in 2023 compared to 2021.
Future threats	No data
Social & use information	
Ownership	Special Marine Protected Areas for Seagrass in Xincun Port and Li'an Port of Lingshui
Management regime	Within the demonstration area, there is “Special Marine Protected Areas for Seagrass in Xincun Port and Li'an Port of Lingshui”. The area is managed and protected in accordance with the "Marine Special Protected Area Management Regulations", "Lingshui Xincun Port and Li'an Port Seagrass Special Protected Area Management Regulations", and "Lingshui Xincun Port and Li'an Port Seagrass Special Protected Area Construction and Management Plan". In the protected areas, resource surveys were conducted, and their plans were integrated with the "Overall Planning of Hainan Xincun Port and Li'an Port Seagrass Special Protected Area (2023-2035)" and "Hainan Natural Protected Area Integration and Optimization Plan". According to the integration and optimization results of natural protected areas, The Li'an Port area of the reserve, covering 1,000.48 ha, has optimized 965.81 ha into Hainan Lingshui Li'an Port Provincial Marine Natural Park. Lingshui Li Autonomous County has issued and implemented the Xincun Port Mangrove (Wetland) Restoration Project.
Current use	Special Marine Protected Area
Traditional use	Agriculture, fisheries and tourism
Potential use	Scientific research and natural education
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The total area of Special Marine Protected Area for Seagrass in Xincun Port and Li'an Port of Lingshui is 2,320 ha, with Li'an Port's seagrass area covering approximately 114 ha.
Biological data	
Species diversity	4 species of seagrass, the coverage ranges from 0% to 21.36%
SCS Endemic species	NA
Endangered or threatened species (IUCN criteria)	*Chelonia mydas*
Source & sink of larvae	No data
Migratory species	*Ardea*、*Spodiopsar sericeus*, *Spatula querquedula*, *Himantopus himantopus*, *Platalea leucorodia*, etc.
Economic valuation	

Parameter	Data & Information needed
(based on Barbier, E.B. 1997)	
Extractive	No data
Non extractive (tourism)	No data
Total Economic Value	No data

Hepu Seagrass Bed

Parameter	Data & Information needed
Geographic informtion	
Name of area	Hepu, Beihai, Guangxi(coastal area)
Co-ordinates	109.3333°E，21.3036°N
Area of coral reefs	NA
Area of seagrass beds	48.08 ha
Reef type	NA
Environmental state information	
Present status	The average coverage and density of seagrass are 36.7% and 4005 shoots/m^2 respectively.
Present threats	Marine engineering: port dredging
	Alien species invasion : rapid expansion of *Spartina alterniflora.*
Trends of change	The coverage and density of seagrass increased in 2023 compared to 2022.
Future threats	No data
Social & use information	
Ownership	Dugong National Nature Reserve in Hepu of Guangxi
Management regime	Within the demonstration area, there is “Dugong National Nature Reserve in Hepu of Guangxi”. The reserve management station manages the area in accordance with the "Regulations of the People's Republic of China on Nature Reserves". Regular monitoring and surveys are conducted on seawater, marine sediments, and biological resources in the reserve. The station has established research cooperation mechanisms with universities and research institutes, and has implemented wetland vegetation restoration projects.
Current use	National nature reserve
Traditional use	Agriculture and fisheries
Potential use	Scientific research and natural education
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The core area of Dugong National Nature Reserve in Hepu of Guangxi covers 13,200 ha, the buffer zone covers 11,000 ha, the experimental area covers 10,800 ha, and the seagrass area covers 48.08 ha
Biological data	
Species diversity	2 species of seagrass, the coverage ranges from 20.0% to 76.7%.
SCS Endemic species	NA
Endangered or threatened species (IUCN criteria)	*Dugong dugon*, *Sousa chinensis*, *Neophocaena phocaenoides*, *Chelonia mydas*
Source & sink of larvae	No data
Migratory species	National first-class protected animals such as *Platalea minor*, *Egretta eulophotes*, *Tringa guttifer*, *Larus saundersi*, etc. National second-class protected animals such as *Platalea leucorodia*, *Numenius arquata*, *Merops philippinus*, *Calidris tenuirostris*, etc.
Economic valuation (based on Barbier, E.B. 1997)	
Extractive	No data
Non extractive (tourism)	No data
Total Economic Value	No data

Liusha Bay Seagrass Bed

Parameter	Data & Information needed
Geographic informtion	
Name of area	Liusha Bay, Zhanjiang, Guandong(Bay)
Co-ordinates	110.0018°E，20.2422°N
Area of coral reefs	NA
Area of seagrass beds	710.44 ha
Reef type	NA
Environmental state information	
Present status	The average coverage and biomass of seagrass are 44.4% and 28.42 g/m^2 respectively, the density ranges from 520.0 to 6193.1 shoots/m^2.
Present threats	Land based pollution: domestic sewage from coastal villages, pond aquaculture wastewater.
Trends of change	The seagrass density increased while coverage decreased in 2023 compared to 2021.
Future threats	No data
Social & use information	
Ownership	Qindou town government and Seagrass County-level Nature Reserve in Leizhou of Zhanjiang
Management regime	Within the demonstration area, there is Seagrass County-level Nature Reserve in Leizhou of Zhanjiang. Currently, there is no specialized management agency or personnel, and it is under local administration. Zhanjiang City has implemented multiple marine ecosystem restoration projects for Liusha Bay seagrass, mangroves, and seaweed.
Current use	County-level nature reserve
Traditional use	Agriculture and fisheries
Potential use	Scientific research and natural education
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The Seagrass County-level Nature Reserve in Leizhou of Zhanjiang consists of core areas and general control areas, with a total area of 3370.54 ha, of which seagrass covers 710.44 ha.
Biological data	
Species diversity	4 species of seagrass, the coverage ranges from 5.3% to 88.3%.
SCS Endemic species	NA
Endangered or threatened species (IUCN criteria)	No data
Source & sink of larvae	No data
Migratory species	*Eurynorhynchus pygmeus*, *Platalea minor* and *Calidris tenuirostris*
Economic valuation (based on Barbier, E.B. 1997)	
Extractive	No data
Non extractive (tourism)	No data
Total Economic Value	No data

Yifengxi Seagrass Bed

Parameter	Data & Information needed
Geographic informtion	
Name of area	Yifengxi, Shantou, Guangdong(Estuary)
Co-ordinates	116.5339°E，23.3224°N
Area of coral reefs	NA
Area of seagrass beds	315.38 ha
Reef type	NA
Environmental state information	
Present status	The average coverage, density and biomass of seagrass are 70.0%, 1531.1 shoots/m^2, and 24.3 g/m^2 respectively.
Present threats	Land based pollution: Non-point source pollution from goose and bullfrog farms in the downstream of Yifengxi
Trends of change	The seagrass density and coverage decreased in 2023 compared to 2022.
Future threats	No data
Social & use information	
Ownership	Chenghai District, Shantou City
Management regime	No protected areas and specialized management agencies have been established in the demonstration area. The area has been incorporated into the national ecological protection red line and Guangdong marine ecological red line, and is managed accordingly. The Yifengxi provincial important wetland within the demonstration area is protected in accordance with the "Shantou Wetland Protection Plan (2025-2035)".
Current use	Yifengxi Wetland Park
Traditional use	Agriculture and fisheries
Potential use	Scientific research and natural education
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	Yifengxi Wetland Park, seagrass covers 315.38 ha.
Biological data	
Species diversity	1 species of seagrass, the coverage ranges from 56.7% to 80.0%
SCS Endemic species	NA
Endangered or threatened species (IUCN criteria)	No data
Source & sink of larvae	No data
Migratory species	*Eurynorhynchus pygmeus*, *Aythya baeri*, *Emberiza aureola*, *Grus leucogeranus*
Economic valuation (based on Barbier, E.B. 1997)	
Extractive	No data
Non extractive (tourism)	No data
Total Economic Value	No data

Wetland

Xinyingwan

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Danzhou (Xinyingwan)
Co-ordinates	E109°12′1.27" ~109°19′41.15" ,N19°40′5.50" ~19°47′44.75" (Hainan Danzhou Xinyingwan Mangrove Municipal Nature Reserve)
Total area	
Areas of mangrove forest	745.6 ha
Area of tidal flats	1875.89 ha
Area of seagrass beds	489.31 ha
Social & use information	
Ownership	Most of it is owned by the Hainan Danzhou Xinyingwan Mangrove Municipal Nature Reserve, while the rest is owned by Hainan Province.
Management regime	1. Zoning control. It is included in the "Implementation Opinions on the Ecological Environment Zoning Control of 'Three Lines and One List' in Danzhou City". 2. Danzhou Xinyingwan Mangrove Municipal_level Nature Reserve were established.
Current use	The ecotourism, aquaculture and fishing.
Potential use	Nature education.
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The total area of the municipal-level Mangrove Nature Reserve in Danzhou is 2,071.15 ha, with the main protected object being the mangrove ecosystem.
Biological data	
Present status	Mangrove vegetation covers an area of 745.6 ha. The average coverage of seagrass area was 8.46%.
Natural/Managed	
Mangrove diversity	22 species
Seagrass diversity	2 species
Migrating species	99 species, including the Eurasian curlew (*Tringa nebularia*) and the spoon-billed sandpiper (*Calidris pygmeus*).
SCS Endemic species	Litsea cubeba and Hainan green ox bile (a species endemic to Hainan)
Endangered or threatened species (IUCN criteria)	Spoon-billed sandpiper, black-faced spoonbill, and Hainan mangrove plover (*Sonneratia hainanensis*).
Source & sink of larvae	N.A.
Stress-pressure information	
Intrinsic/internal sources of change	Biological invasion and local harmful species, insect pests.
Extrinsic/external sources of change	Reclamation for aquaculture, land based pollution.
Rates of change, historical review	N.A
Social and economic drivers of change in environmental state	Aquaculture growth, population growth.
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	

Properties and Variables	Data & Information needed
Values from environmental services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Beilun River Estuary

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Beilun River Estuary
Co-ordinates	21°31'00"~21°37'30"N, 108°00'30"~108°16'30"E
Total area	21830.13 ha
Areas of mangrove forest	1097.95 ha
Area of tidal flats	10 415.80 ha
Area of seagrass beds	
Social & use information	
Ownership	Most of it is owned by the Guangxi Beilunhekou National Nature Reserve, while the rest is owned by Guangxi Zhuang Autonomous Region
Management regime	1. Zoning control. Included in the "Implementation Opinions of Fangchenggang Municipal People's Government on Ecological Environment Zoning Control of' Three Lines and One List'" (Fangzhenggui〔2021〕No.4). 2. Guangxi Beilun River Estuary National Nature Reserve was established.
Current use	Ecotourism, aquaculture and fishing.
Potential use	Research, nature education,.
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	Guangxi Beilun River Estuary National Nature Reserve covers a total area of 3000 ha, and its main protection objects are mangrove ecosystem, coastal transition zone ecosystem, seagrass bed ecosystem and biodiversity.
Biological data	
Present status	1097.95 ha
Natural/Managed	
Mangrove diversity	15 species
Seagrass diversity	5 species
Migrating species	80 species, including the Baer's pochard (*Aythya baeri*) and the spoon-billed sandpiper (*Calidris pygmeus*).
SCS Endemic species	
Endangered or threatened species (IUCN criteria)	13 species, including rare and endangered species such as spoon-billed sandpiper and black-faced spoonbill.
Source & sink of larvae	N.A.
Stress-pressure information	
Intrinsic/internal sources of change	Biological invasion and insect pests.
Extrinsic/external sources of change	Reclamation for aquaculture,urbanization.
Rates of change, historical review	N.A.
Social and economic drivers of change in environmental state	Population growth, economic development and technology development.
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	
Values of potential (commercial)	

Properties and Variables	Data & Information needed
sustainable use	
Total Economic Value	

Maoweihai

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Guangxi Maweihai
Co-ordinates	108°28′E~108°37′E,21°46′N~21°54′N
Total area	5010.05 ha
Areas of mangrove forest	2539.12 ha
Area of tidal flats	3628 ha
Area of seagrass beds	
Social & use information	
Ownership	Most of it is owned by the Guangxi Maoweihai Mangrove Nature Reserve, while the rest is owned by Guangxi Zhuang Autonomous Region
Management regime	1. Zoning control. Incorporated into the "Qinzhou City Three Lines and One List Ecological Environment Zoning Control Implementation Guidelines". 2. Guangxi Maoweihai Mangrove Nature Reserve at the autonomous region level and Guangxi Qinzhou Maoweihai National Marine Park were established.
Current use	Ecotourism, aquaculture and fishing.
Potential use	Scientific research, nature education,, etc.
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The Guangxi Maoweihai Mangrove Nature Reserve covers 5,010.05 ha, while the Guangxi Qinzhou Maoweihai National Marine Park spans 3,482.7 ha.
Biological data	
Present status	The protection status is sound, with remarkable achievements made in aspects including laws and regulations, ecological restoration, monitoring and management, and public participation.
Natural/Managed	
Mangrove diversity	17 species
Seagrass diversity	Baker likes salt grass, etc.
Migrating species	
SCS Endemic species	
Endangered or threatened species (IUCN criteria)	
Source & sink of larvae	
Stress-pressure information	
Intrinsic/internal sources of change	Insect pests.
Extrinsic/external sources of change	Reclamation, port construction projects, environmental pollution (such as eutrophication).
Rates of change, historical review	NA
Social and economic drivers of change in environmental state	Population growth, economic development
Economic valuation (based on Barbier, E.B. 1997)	
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	

Properties and Variables	Data & Information needed
Values of potential (commercial) sustainable use	
Total Economic Value	

Pearl River Estuary

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Pearl River Estuary
Co-ordinates	N22°54', E113°95'
Total area	12783 ha
Areas of mangrove forest	1640 ha
Area of tidal flats	27.0909 ha
Area of seagrass beds	N.A.
Social & use information	
Ownership	It belongs to the Guangdong Province (state owner) and multiple nature reserves such as the Pearl River Estuary Chinese White Dolphin Nature Reserve have been established for protection and management.
Management regime	It is included in the ecological protection red line.
Current use	Leisure tourism, nature education, aquaculture, scientific research, etc.
Potential use	Scientific research, ecotourism, etc.
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	A system of protected natural areas has been established. From 2008 to 2021, four wetland parks were mainly built, with a total area of 1,373.47 ha. Before 2008, two national nature reserves and one provincial nature reserve were mainly built.
Biological data	
Present status	The health status of the Pearl River Estuary ecosystem has remained stable over the years. It was in an unhealthy state from 2008 to 2009, and has been in a sub-healthy state from 2010 to 2024.
Natural/Managed	
Mangrove diversity	18 species
Seagrass diversity	
Migrating species	51 species
SCS Endemic species	31 species
Endangered or threatened species (IUCN criteria)	43 species
Source & sink of larvae	
Stress-pressure information	
Intrinsic/internal sources of change	Biological invasion and local harmful species.
Extrinsic/external sources of change	The influence of natural factors such as typhoons, and land based pollution.
Rates of change, historical review	From 1984 to 2018, the coastal wetland in the Pearl River Estuary showed a positive growth trend, in which the total area of tidal vegetation increased significantly, and the area of salt marsh maintained a relatively stable state.The intensification of urban reclamation caused the salt marsh wetland area at the Pearl River Estuary to decrease by 75.78% between 2010 and 2015. Since 2018, the restoration of the salt marsh wetland has progressed slowly due to the expansion and eradication of Spartina alterniflora, coupled with initiatives like coastal restoration efforts. In 2023, the salt marsh area reached 828 ha, marking a 74.29% reduction

Properties and Variables	Data & Information needed
	from 2010 levels and a 6.15% increase compared to 2015.
Social and economic drivers of change in environmental state	Population growth, economic development and technology development.
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

Dahu

Properties and Variables	Data & Information needed
Geographic information	
Name of area	Guangdong Dahu
Co-ordinates	The western section of the Great Lake, N22°50'21"~22°52'31",E115°30'1"~115°32'38"; Dahu east Subdivision, N22°49'59"~22°52'29",E115°31'57"~115°37'1"; The north sector section of Liananwei, N22°50'25"~22°55'9",E115°15'3"~115°19'32"; The south sector section of Liananwei, N22°48'43"~22°50'13",E115°10'34"~115°15'51".
Total area	6815.29 ha
Areas of mangrove forest	53.93 ha
Area of tidal flats	54.98 ha
Area of seagrass beds	0
Social & use information	
Ownership	Managed by the Guangdong Haifeng Bird Provincial Nature Reserve, most of the land is owned by the collective.
Management regime	Regulations such as the "Interim Management Regulations for the Haifeng Bird Nature Reserve" were promulgated for management, and rules and regulations such as the "Wildlife Patrol and Monitoring System" and the "Community Forest and Bird Protection Convention" were formulated. The reserve has successively compiled the "Overall Planning for the Guangdong Haifeng Bird Nature Reserve (2007-2006)" in 2007 and the "Revised Overall Planning for the Guangdong Haifeng Bird Provincial Nature Reserve (2022-2025)" in 2023.
Current use	Ecotourism, aquaculture, fishing, and land leasing.
Potential use	Research, natural education, community co-management.
Significance/national importance	The area has been designated into the national ecological protection red line.
Protection status	The total area of natural and artificial wetlands in the reserve amounts to 4782.28 ha. Among them, the area of natural wetlands is 2345.56 ha, and the area of artificial wetlands is 2436.72 ha, accounting for 41.49% of the total area of the reserve. In the natural wetlands, there are 1667.88 ha of coastal and offshore wetlands. Among them, the muddy beach accounts for 54.98 ha, and the mangroves cover 38.30 ha.
Biological data	
Present status	
Natural/Managed	
Mangrove diversity	There are 25 species, including 9 true mangroves, 5 semi-mangroves and 11 associated plants.
Seagrass diversity	N.A.
Migrating species	154 species, including the Black-faced Spoonbill (*Platalea minor*) and the Crested Pelican (*Pelecanus crispus*).
SCS Endemic species	Black-faced Spoonbill (*Platalea minor*)、Purple Swamphen (*Porphyrio porphyrio*), and others.
Endangered or threatened species (IUCN criteria)	
Source & sink of larvae	
Stress-pressure information	

Properties and Variables	Data & Information needed
Intrinsic/internal sources of change	Biological invasion and local harmful species.
Extrinsic/external sources of change	The influence of natural factors such as typhoons, environmental pollution.
Rates of change, historical review	N.A.
Social and economic drivers of change in environmental state	Population growth, economic development and technology development.
Economic valuation (based on Barbier, E.B. 1997)	N.A.
Values of direct use	
Values of indirect use	
Values from environmental services	
Value of investment	
Values of potential (commercial) sustainable use	
Total Economic Value	

3.2 Overview of Key Mangrove Area

The SCS SAP Project selected five mangrove demonstration areas for investigation and research, including Dongzhaigang, Shankou, Zhanjiang, Yangjiang and Huidong.

（1）Dongzhaigang site

The total area of the Dongzhaigang site is 3,337.6 ha, covering mangroves, tidal flats, and other vegetation types within the administrative jurisdiction of Haikou City . By 2025, the mangrove area has reached 1,771 ha(China Green Times, 2025). There are 25 mangrove species belonging to 14 genera and 11 families, and 11 semi-mangrove species belonging to 11 genera and 9 families. The natural forest coverage rate of the reserve is 53.44%, and the mangrove density is approximately 700–33,700 plants per ha(Haikou Dongzhai Port National Nature Reserve Administration, 2023).。

According to the 2023 Self-Assessment Report on Ecological Environment Protection Effectiveness, Dongzhaigang site is home to 272 species of vascular plants, including 14 fern species, 5 gymnosperm species, and 253 angiosperm species. Meanwhile, it serves as a habitat and foraging ground for 9 mammal species, 217 bird species, 6 amphibian species, 13 reptile species, 208 insect species, 174 fish species, and 221 benthic animal species. During the migration season, species such as the *Egretta garzetta, Ardeola bacchus, Limosa limosa, Anas acuta, Charadrius mongolus, Charadrius leschenaultii, Tringa nebularia* and *Tringa totanus* migrate in flocks and become the dominant species in the waters. With high species diversity and abundant resources, Dongzhaigang site is a key node on the East Asian-Australasian Flyway and holds great significance for studying cross-border biogeographic diffusion and evolution in the region. It is also one of the first reserves in China to be included in the List of Wetlands of International Importance, with its main conservation targets being the coastal mangrove ecosystem, rare and endangered species represented by waterfowl, and biodiversity within the zone.

Since 2013, to prevent the degradation of the mangrove and wetland ecosystem caused by factors such as *pill bugs*, typhoons, and sea-level rise, Dongzhaigang site has adopted multiple measures to carry out mangrove restoration through models such as returning ponds to forests and afforestation on tidal flats (China.com.cn, 2025).

Currently, Dongzhaigang site faces common challenges typical of nature reserves, including pressures from human activities such as illegal coastal foraging, tourism development, and agricultural non-point source pollution, as well as natural threats like typhoons, harmful organisms, and alien species invasion

（2）Shankou site

The Shankou site is mainly composed of the Guangxi Shankou Mangrove Ecological Nature Reserve, located in Yingluo Port and Dandou Sea on both the east and west sides of the Shatian Peninsula in Hepu County, Guangxi. According to the 2021 National Land Third Survey data, the total area of the Shankou Mangrove Demonstration Zone is 8,003 ha, with mangroves covering 876 ha. A 2023 survey shows that there are 16 mangrove plant species in the reserve, including 10 true mangrove species and 6 semi-mangrove species, with a mangrove density of approximately 16,325 plants per ha (Guangxi Zhuang Autonomous Region Marine Environmental Monitoring Center Station, 2023).

According to the 2021 Management Plan Report, the Shankou site is home to 16 mangrove plant species, 22 phytoplankton species, 32 zooplankton species, 358 macro-benthic animal species, 68 fish species, 451 insect species, and 239 bird species (Guangxi Shankou Mangrove Ecological Nature Reserve Management Center, 2021). Species such as *Grus japonensis* and *Larus saundersi* are migratory species in this region.

For the mangrove restoration projects implemented in the reserve, a total of over 200 million yuan has been invested, with funds coming from sources including the Central Marine Ecological Restoration Fund, the Central Forest Reform Wetland Subsidy Fund, and the Central Budgetary Fund.

The Shankou site faces common challenges of nature reserves, such as human interference and natural threats. On the human side, issues like aquaculture pollution; on the natural side, frequent typhoons and erosion by alien invasive species pose constant threats to the ecological foundation.

（3）Zhanjiang site

The Zhanjiang site is mainly composed of the Guangdong Zhanjiang Mangrove National Nature Reserve, located on the coastal tidal flats of the Leizhou Peninsula. With a total area of 20,278.8 ha, including 7,228 ha of mangroves, it is the largest nature reserve for mangroves in China. According to relevant reports in 2022, the demonstration zone has 26 true and semi-mangrove species belonging to 15 families. The density of *Aegiceras corniculatum* communities is approximately 44,000–112,400 plants/hm², *Sonneratia apetala communities* about 600–2,500 plants/hm², Bruguiera gymnorrhiza seedlings 6,560 plants/hm², and Rhizophora stylosa seedlings 140 plants/hm² (Zhanjiang Municipal Bureau of Natural Resources, 2022).

According to relevant reports in 2023, the Zhanjiang site is home to 130 shellfish species (41 families), 139 fish species (60 families), 19 shrimp species (3 families), 57 crab species (11 families), 126 plankton species, 256 benthic diatom species, and 130 insect species (Guangdong Forestry Bureau, 2025). Meanwhile, it lies within the East Asian-Australasian Waterbird Flyway and serves as a key habitat for waterbirds, with 312 bird species. Among them, 66 are listed in China's National Key Protected Species List, 3 in Appendix Ⅰ and 41 in Appendix Ⅱ of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and 5 are classified as "Vulnerable" in the IUCN Red List. It is currently the largest wintering ground for *Calidris pygmaea* in China. Long-term monitoring shows a growing trend in both the population and quantity of birds in the reserve. In 2019, the Zhanjiang Mangrove Reserve became one of the first Guangdong Provincial Nature Education Demonstration Bases; in 2022, it was designated as a Guangdong Provincial Science Popularization Education Base. As a key area for biodiversity conservation in China and an important in-situ conservation base for international wetland ecosystems, its main conservation object is the mangrove ecosystem.

The reserve has implemented projects including the protection of characteristic wild populations and rare and endangered mangrove plants, mangrove afforestation and restoration in tidal flats and obsolete aquaculture ponds, and control of harmful

organisms, and rehabilitation of degraded forests (Southern Rural News, 2025). It also carries out projects related to the sustainable use of mangroves—such as ecological aquaculture and ecotourism—including science popularization, education, and scientific research initiatives.

The Zhanjiang site faces both human-induced and natural challenges, such as high landscape fragmentation, a high proportion of the exotic tree species Sonneratia apetala, invasion by the alien plant Spartina alterniflora (smooth cordgrass), damage caused by Derris (a native plant), and the urgent need to strengthen the protection of rare and endangered mangrove plants.

（4）Yangjiang site

According to relevant reports in 2024, the Yangjiang site is located on the southwestern coast of Guangdong Province and is also one of the main mangrove distribution areas in China. It currently has a mangrove area of 1,343 ha (Yangjiang Municipal People's Government, 2024), ranking third in Guangdong Province. It houses protected areas including the Guangdong Hailing Island Mangrove National Wetland Park, Guangdong Yangdong Shouchang River Mangrove National Wetland Park, and Yangxi Chengcun Mangrove County-level Nature Reserve, with a total area of 1,784.08 ha. Various mangrove wetland parks have taken initial shape, forming a "marine forest" with rich biodiversity and good protection.

In the Yangjiang mangroves, critically endangered (CR) species such as *Calidris pygmaea*, *Aythya marila*, and *Eretmochelys imbricata*, as well as endangered (EN) species like *Ciconia boyciana* and *Tringa guttifer,* have been recorded. The Yangjiang mangroves serve as a key stopover and wintering ground on the East Asian-Australasian Flyway (EAAF), one of the world's most important migratory bird routes.

Yangjiang enhances disaster prevention and mitigation capabilities by building graded ecological seawalls and reinforcing dangerous sluices. Relying on 20,000 mu (approximately 1,333.33 ha) of mangroves to form a natural ecological barrier, the intertwined roots of mangroves can reduce wave energy by over 70%, effectively

lowering the damage rate of seawalls during disasters such as typhoons.

The Yangjiang site faces human-induced environmental pressures including industrial pollution and agricultural aquaculture discharge, which exacerbate ecological risks. It also confronts natural environmental stressors such as frequent typhoons, habitat compression due to sea-level rise, and competition for living space caused by the invasion of *Spartina alterniflora*.

（5）Huidong site

The Huidong site is located on the eastern coast of the Guangdong-Hong Kong-Macao Greater Bay Area and serves as a benchmark area for mangrove ecological restoration in South China. It currently has a mangrove area of over 1,000 ha, among which the Kaozhouyang area has formed a contiguous wetland of 10,000 mu (approximately 666.67 ha). The Shiqiaotan Mangrove, the core area, was included in Guangdong Province's List of Important Wetlands in 2025 (with an area of 56.14 ha). Over the past decade, with a total investment of nearly 300 million yuan, 12 restoration projects have been implemented: nearly 9,000 mu of new mangroves have been planted, and 2,000 mu of existing mangroves have been restored. It also pioneered China's first mangrove carbon sink development right transaction, achieving a transaction record of 4 million yuan in 2024 and promoting the conversion of ecological value into economic value (Huidong Media, 2024).

According to relevant reports in 2025, the Huidong site has achieved remarkable results in biodiversity conservation, supporting 13 species of higher plants and 276 species of vertebrates. Among these, 129 fish species, 6 amphibian species, 21 reptile species, 115 bird species, and 5 mammal species inhabit the area (Biodiversity Knowledge Platform, 2025). It is the northernmost distribution site of wild *Lumnitzera racemosa* (Critically Endangered, CR) on the Chinese mainland. Research teams have rescued and protected over 2,000 individuals through artificial propagation, solving the technical problem of extremely low seed germination rates. As a key node on the East Asian-Australasian Flyway, the Kaozhouyang Wetland attracts a large number of migratory birds for wintering from December to April each year, with rare waterbirds such as *Platalea minor* (Endangered, EN) observed here.

In terms of disaster prevention and mitigation, the contiguous mangroves form a natural ecological barrier. Their complex root systems can effectively reduce the energy of typhoon-generated waves, safeguarding the ecological security of the 163-kilometer coastline of the Renping Peninsula. Meanwhile, through models such as carbon sink transactions and ecotourism, the mangroves have transformed from "coastal guardians" into "green assets," providing a demonstration model for coastal wetland protection and regional sustainable development (China Daily, 2025).

The Huidong site mainly faces challenges including the difficulty in balancing protection and development, invasion by alien plants, pest and disease stress, marine debris pollution, and insufficient infrastructure (South China Survey and Planning Institute of National Forestry and Grassland Administration, 2019).

3.3 Overview of Key Seagrass Are

SCS Phase II Project selected five seagrass demonstration areas for investigation and research, including Xincun and Li'an in Hainan, Hepu in Guangxi, Liusha Bay and Yifengxi in Guangdong. Meanwhile, building on the SCS Phase I Project, investigations were conducted on the overlapping seagrass beds in four locations: Xincun and Li'an in Hainan, Hepu in Guangxi, and Liusha Bay in Guangdong. The relevant findings are presented in the table below.

Table 3.3-1 Comparison of Historical Seagrass Bed Data

Seagrass Bed	Survey Date	Area (ha)	Biomass(g/m^2)	Density (shoots/m^2)	Number of Species	Species
Xincun	2002	200	1134	1209	4	*Enhalus acoroides, Thalassia hemprichii, Cymodocea rotundata, Halodule uninervis*
	2021(Hainan Academy of Forestry, 2021)	301	23	775	5	*E. acoroides, T. hemprichii, C. rotundata, H. uninervis, Halophila ovalis*
Li'an	2002	320	577	1200	5	*E. acoroides, T. hemprichii, C. rotundata, H. uninervis, H. ovalis*
	2021	114	51	248	4	*E. acoroides, T. hemprichii, C. rotundata, H. ovalis*
Hepu	2003	540	25.5	1385	4	*H. ovalis, H. uninervis, Zostera japonica, Halophila beccarii*
	2023(Guangxi Zhuang Autonomous Region Marine Environment Monitoring Center Station, 2023)	48.08	25	4005	2	*H. ovalis, H. beccarii*
Liusha Bay	2002 年	900	22	5958	2	*H. ovalis, H. uninervis*
	2020 年(Yang Xi et al., 2023)	710.44	28	973	4	*H. ovalis, Halophila minor, H. beccarii, H. uninervis*

（1）Xincun seagrass demonstration area in Hainan

The seagrass bed area in Xincun seagrass demonstration area is 301 ha. There are 5 species of seagrass belonging to 2 famiies, 3 subfamilies, and 5 genera, including

Cymodocea rotunda, *Thalassia hemprichii*, *Enhalus acoroides*, *Halophila ovalis*, and *Halodule uninervis*. The biomass and density of seagrass in 2021 significantly decreased compared with 2002. In recent years, the density and coverage of seagrass in Hainan have shown growth, with the area of seagrass beds remaining stable. Monitoring results from fixed monitoring areas on east coast of Hainan show that the average density increased from 2022 to 2023, with the average density in 2023 reaching 575 shoots/m^2, which represents a 60.5% increase compared to 358 shoots/m^2 in 2022(Ministry of Ecology and Environment of the People's Republic of China, 2022, 2023). The survey results of the SCS SAP Project in Xincun seagrass demonstration area indicate that from 2021 to 2023, the area decreased from 301 ha to 224.92 ha, seagrass coverage increased from 9.90% to 36.77%, and seagrass density increased from 775.11 shoots/m^2 to 1027.33 shoots/m^2.

In 2022, the National Forestry and Grassland Administration took Xincun Port, Lingshui as one of the important habitats for migration routes of China's migratory birds(Department of Territorial Ecological Restoration, Ministry of Natural Resources of the People's Republic of China, 2025). In 2021, 16 migratory bird species were monitored, including *Egretta garzetta*, *Spodiopsar sericeus*, *Spatula querquedula* and *Himantopus himantopus*(Hainan Academy of Forestry, 2021). In 2023, the national second-class protected wild animal, *Platalea leucorodia*, was newly discovered(Lingshui Li Autonomous County People's Government, 2023).

Currently, the seagrass beds in Xincun are facing threats from mariculture, fishing activities, and input of land-based pollutants. Moreover, sediment accumulation at the lagoon mouth is also affecting the richness and area coverage of seagrass in this region.

（2）Li’an seagrass demonstration area in Hainan

The seagrass bed area in Xincun seagrass demonstration area is 114 ha. There are 4 species of seagrass belonging to 2 families, 3 subfamilies, and 4 genera, including *Cymodocea rotunda*, *Thalassia hemprichii*, *Enhalus acoroides*, and *Halophila ovalis*.

The distribution area, biomass and density of seagrass in 2021 have significantly decreased compared with 2002. In recent years, the density and coverage of seagrass

in Hainan have shown growth, with the area of seagrass beds remaining stable. Monitoring results from fixed monitoring areas on east coast of Hainan show that the average density increased from 2022 to 2023, with the average density in 2023 reaching 575 shoots/m^2, which represents a 60.5% increase compared to 358 shoots/m^2 in 2022(Ministry of Ecology and Environment of the People's Republic of China, 2022, 2023). The survey results of the SCS SAP Project in Li;an seagrass demonstration area indicate that from 2021 to 2023, the area decreased from 114 ha to 101.73 ha, seagrass coverage increased from 10.80% to 43.33%, and seagrass density increased from 248.00 shoots/m^2 to 631.56 shoots/m^2.

In 2021, 16 migratory bird species were monitored, including *Egretta garzetta*, *Spodiopsar sericeus*, *Spatula querquedula* and *Himantopus himantopus*(Hainan Academy of Forestry, 2021). In 2023, the national second-class protected wild animal, *Platalea leucorodia*, was newly discovered(Lingshui Li Autonomous County People's Government, 2023).

Currently, the Li'an seagrass bed is affected by coastal domestic sewage, pond aquaculture wastewater, fishing cage feed residues and excreta discharged into the lagoon, resulting in unstable water environment. In addition, the high-intensity fishing activities carried out by coastal residents in the lagoon pose a significant threat to seagrass communities.

（3）Hepu seagrass demonstration area in Guangxi

The seagrass bed area in the Hepu seagrass demonstration area is 48.08 ha, with only one species of seagrass, *Halophila beccarii*. The biomass of seagrass remained stable in 2023 compared with 2003, with a significant increase in density but a substantial decrease in distribution area. The increase in seagrass density may be related to changes in dominant seagrass species in Hepu. Large sized species such as *Zostera japonica*, which were once widely distributed, are now rarely seen and has been replaced by smaller seagrass species like *Halophila ovalis* and *Halophila beccarii*, which are better adapted to environmental changes. In recent years, the density and coverage of seagrass in Beihai, Guangxi have shown growth, and the area become stable. Monitoring results from fixed monitoring areas in Beihai, Guangxi show that

average density and coverage have been increasing overall from 2020 to 2023. In 2023, the average density was 4452 shoots/m^2, representing a 211.4% increase compared to 956 shoots/m^2 in 2022(Ministry of Ecology and Environment of the People's Republic of China, 2022, 2023). The survey results of SCS SAP Projects show that compared with 2022, the seagrass bed area increased from 37.09 ha to 48.08 ha in 2023, the seagrass coverage increased from 34.3% to 35.1%, and the seagrass density increased from 1430 shoots/m^2 to 4452 shoots/m^2.

The waters near Hepu historically had abundant dugong resources (Guangxi Zhuang Autonomous Region Forestry Survey and Design Institute & Hepu Dugong National Nature Reserve Management Station, 2016). In 2022, various migratory birds were observed, including national first-class protected animals such as *Platalea minor*, *Egretta eulophotes*, *Tringa guttifer*, and *Larus saundersi*, as well as national second-class protected animals such as *Platalea leucorodia*, *Numenius arquata*, *Merops philippinus*, *Calidris tenuirostris*, etc(CCTV News, 2022).

Since the 21st century, the seagrass beds in Hepu have been directly affected by human activities, leading to habitat degradation. Human activities such as shellfish digging, clam raking, and sandworm harvesting on the seagrass bed may result in the loss of soil seed banks of *Halophila beccarii*. Additionally, engineering projects such as port dredging operations, as well as water eutrophication, pose serious threats to the Hepu seagrass beds.

（4）Liusha Bay seagrass demonstration area in Guangdong

The seagrass bed area in the Liusha Bay seagrass demonstration area is 710.44 ha. There are 4 species of seagrass, including *Halophila ovalis*, *Halophila minor*, *Halophila beccarii*, and *Halodule uninervis*, among which *Halophila ovalis* is the absolutely dominant species in Liusha Bay. The seagrass distribution area and density in 2020 decreased compared with 2002, while biomass significantly declined. In recent years, the overall area of seagrass beds in Guangdong remaine stable. Survey results show that the distribution area of seagrass beds fluctuates between 700-900 ha; from 2022 to 2023, seagrass density increased from 1125.14 shoots/m^2 to 2480.31 shoots/m^2, while seagrass coverage decreased from 63.75% to 54.44%.

The Liusha Bay is home to large areas of mangroves and seagrass beds, boasting rich biological resources. The Leizhou Peninsula, including Liusha Bay, is an important passage in the East Asia-Australasia flyway, and also one of the world's most crucial migratory bird routes. Various migratory birds, including national protected species such as the *Eurynorhynchus pygmeus* (National Forestry and Grassland Administration, 2025), *Platalea minor* (Guangdong Youth League, 2023), and *Calidris tenuirostris* (Zhanjiang Evening News, 2025) were observed in this area.
Currently, the seagrass beds in Liusha Bay are facing threats such as encroachment by marine aquaculture, land based pollution and fishing activities.

（5）Yifengxi seagrass demonstration area in Guangdong

The seagrass bed area in the Yifengxi seagrass demonstration area is 315.38 ha, with only one species of seagrass, *Halophila beccarii*. The survey results show that the seagrass bed distribution area remains around 300 ha; compared to 2022, the seagrass density decreased from 9696.95 shoots/m^2 to around 4000 shoots/m^2 in 2023, and the seagrass coverage decreased from 60.67% to around 20%.

The Yifengxi is an important tributary in the downstream delta area of the Han River, serving as one of the components of the Han River delta waterway. The Han River Estuary is a wetland with the highest number of endangered bird species in Guangdong. Since 2010, five critically endangered bird species have been recorded at the Han River Estuary, including the *Thalasseus bernsteini*, *Eurynorhynchus pygmeus*, *Aythya baeri*, *Emberiza aureola* and *Grus leucogeranus*. There are also 13 vulnerable and endangered bird species, with 15 and 45 species respectively listed as first-class and second-class national protected birds (National Forestry and Grassland Administration, 2024). In 2024, migratory birds such as *Egretta garzetta*, *Larus ridibundus*, *Aythya baeri*, *Alcedo atthis*, and *Calidris alpina* were observed in Yifengxi (Southern Metropolis Daily, 2024).

Currently, Yifengxi seagrass beds are facing threats such as fishing activities and input of land-based pollutants.

3.4 Overview of Key Other Coastal Wetland Areas

Considering the cross-border significance and representativeness of the sites, five sites were selected for analysis, including the estuary of Danzhou (Xinying Bay) in Hainan, the estuary of Beilun in Guangxi, the estuary of Maoweihai in Guangxi, the estuary of Pearl River and the shallow sea area of Dahu in Guangdong.

（1）Hainan Danzhou (Xinyingwan) Wetland Site

Xinyingwan is a coastal wetland ecosystem integrating diverse habitats including shallow seawater zones, estuarine areas, sandy beaches, and salt pans. Located in the East Asia-Australia Flyway, it serves as a habitat for 1 species (White-shouldered Eagle, *Aquila heliaca*) under National Class I Protected Wildlife (National Forestry and Grassland Administration, Ministry of Agriculture and Rural Affairs, 2021), as well as 27 species (Such as the little swan, *Cygnus columbianus*, etc.) under National Class II Protected Wildlife. In 2023, Danzhouwan recorded over 200 bird species, an increase of 19 from 2022 (Ma Caozhi, 2023), with wintering waterbirds exceeding 10,000 (Hainan Daily, 2024). Newly detected species include the Oriental White-eye (*Plegadis falcinellus*), Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*), and White-rumped Shearwater (*Platalea leucorodia*). The Xinyingwan Mangrove Nature Reserve, recognized as Hainan Island's largest known habitat for migratory waterbirds and home to the most endangered species, serves as the most stable wintering ground for the Spoon-billed Sandpiper (Hainan Daily, 2023) and the third-largest wintering site for the globally endangered Black-faced Spoonbill (*Platalea minor*) in Hainan. The Danzhou Xinyingwan Mangrove Municipal Nature Reserve has been established in the site to strengthen the protection of mangrove wetland ecosystem and endangered birds such as black-faced spoonbill and spoon-billed sandpiper, with a protected area of 2071.15 ha.

Table 3.4-1 Establishment of protected areas in Xinyingwan Wetland Site

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
1	Danzhou Xinyingwan Mangrove Municipal Nature Reserve	2071.15	Municipal nature reserve	1992 (County-level nature reserve）; 2022 (Municipal nature reserve）	Danzhou County People's Government; Hainan Provincial Government.

At present, the coastal wetland of Xinyingwan is threatened by enclosure aquaculture, input of land-based pollutants and invasive alien species.

（2）Beilun Estuary Wetland Site, Guangxi

The Guangxi Beilun Estuary Wetland Site is located at the southwestern most tip of the Chinese mainland coast, bordering Vietnam to the west. The Guangxi Beilun Estuary Wetland Site is located at the southwestern most tip of the Chinese mainland coast, bordering Vietnam to the west. The coastal wetland area of Guangxi Beilun Estuary is 21,830.13 ha, including 11,904.87 ha of intertidal wetland and 9,925.26 ha of shallow seawater (Zhu Wenjun et al., 2022). The Beilun Estuary Wetland serves as an egg-laying ground for 30 species, a habitat and feeding ground for 55 species, and a migration hub for 40 species. In the Beilun Estuary Wetland, the Baer's pochard (*Aythya baerii*) and hawksbill turtle (*Eretmochelys imbricata*) are listed as Critically Endangered (CR) species in the IUCN Red List of Threatened Species (2021), while the little curlew (*Tringa guttifer*) and sea turtles (*Chelonia spp.*) are recognized as Globally Endangered (EN) species by the IUCN. The Guangxi Beilun Estuary National Nature Reserve is included in the Ramsar Convention's List of Wetlands of International Importance, covering an area of 3,000 ha.

Table 3.4-2 Establishment of protected areas in Beilun River Estuary Site

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
1	Guangxi Beilun River Estuary National Nature Reserve	3000	Ramsar International Important Wetlands, national natural reserve	1985 (County-level Mangrove Nature Reserve）; 1990(Provincial Marine Nature Reserve）; 2000(national natural reserve); 2008(Ramsar International Important Wetlands).	The former Fangcheng County People's Government(1985)； The People's Government of Guangxi Zhuang Autonomous Region(1990); State Council(2000); “Convention on Wetlands of Importance Especially as Waterfowl Habitat”(2008).

At present, the Beilun estuary wetland is facing natural threats such as insect infestation, typhoon and invasion of Spartina alterniflora, as well as human activities such as enclosure pond aquaculture, land based pollution.

（3）Guangxi Maoweihai Estuary Wetland Site

The Guangxi Maoweihai Site encompasses 1,527 ha of muddy tidal flats and 8,403 ha of shallow seawater areas. In 2024, the salt marsh vegetation covered 490 ha, primarily consisting of short-leaf pampas grass and reeds. The dominant benthic fauna included Ningbo mud crabs, spiny cone crabs, and Chinese spiny crabs (South China Sea Bureau, Ministry of Natural Resources, 2024). As a key breeding ground for China's natural oysters, the zone serves as habitat for one nationally protected species (Black Stork, *Ciconia nigra*) under Category I protection (National Forestry and Grassland Administration, Ministry of Agriculture and Rural Affairs, 2021),15 species under Category II protection (including the pelagic cormorant, *Phalacrocorax pelagicus*), and 33 migratory bird species protected under Chinese-Japanese and Chinese-Australian bird protection agreements. Currently, three protected areas or important wetlands have been established within the zone, covering 9,182.7 ha.

Table 3.4-3 Establishment of protected areas in Maoweihai Site

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
1	Guangxi Maoweihai Red Mangrove Nature Reserve	3000	Autonomous Region-level Nature Reserve	1997 (Special protection forest belt of coastal countries); 2005 (Region-level Nature Reserve).	Qin Nan District People's Government(1997); The People's Government of Guangxi Zhuang Autonomous Region Autonomous(2005).
2	Guangxi Maweihai National Marine Park	3482.7	National Marine Park	2011	The former State Oceanic Administration
3	Qinzhou Dafengjiang Estuary Wetland	2700	Key wetlands of the autonomous region	2022	Guangxi Zhuang Autonomous Region Forestry Bureau

At present, the Maoweihai site is threatened by land-based pollution input, human activities such as aquaculture, and natural threats such as invasive alien species.

（4）Pearl River Estuary Wetland Site

The Pearl River Estuary, situated at the southern end of China's Pearl River Basin where it meets the South China Sea, features a unique geographical configuration described as "three rivers converging and eight outlets flowing into the sea". The coastal ecosystem here consists primarily of coastal salt marshes, muddy shores, and sandy shores. Among these, the Modaomen Salt Marsh in Zhuhai, Guangdong Province stands as a key monitoring area for coastal salt marshes in the estuary,

covering 200 ha. The marsh vegetation mainly consists of short-leaf bulrush and reeds, with dominant species including Ningbo mud crab, single-leaf sandworm, and feathered gill sandworm (South China Sea Bureau of the Ministry of Natural Resources, 2024).

The Pearl River Estuary serves as a vital spawning ground, nursery, feeding area, and migration corridor for numerous rare aquatic species in the South China Sea. It hosts 70 species' spawning grounds, provides habitats and feeding grounds for 106 species, and acts as a migration hub for 51 species. The region currently features protected areas including the Guangdong Pearl River Estuary Chinese White Dolphin National Nature Reserve, Guangdong Neilingding Futian National Nature Reserve, Guangdong Zhuhai Hengqin National Wetland Park (pilot), Guangdong Zhongshan Cuiheng National Wetland Park, Guangdong Machong Huayang Lake National Wetland Park, and Guangdong Zhuhai Qiao-Dangan Island Provincial Nature Reserve (Guangdong Provincial Department of Ecology and Environment, 2024). These reserves cover a total area of 58,617.04 ha, primarily protecting typical marine ecosystems, major economic spawning grounds, juvenile fish and shrimp breeding areas, and endemic species such as the Chinese white dolphin and yellow-lipped fish.

Table 3.4-4 Establishment of protected areas in the Pearl River Estuary Site

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
1	National Nature Reserve for Chinese White Dolphins in the Pearl River Estuary	46000	National natural reserve	1999 (provincial-level Nature Reserve), 2003(national natural reserve)	People's Government of Guangdong Province (1999), State Council (2003).
2	Guangdong Neilingding Island-Futian National Nature Reserve	921.64	National natural reserve	1984 (provincial-level Nature Reserve), 1988 (national natural reserve),	People's Government of Guangdong Province (1984), State Council (1988).
3	Mangrove International Important Wetland, Futian, Shenzhen, Guangdong	367.64	National important wetlands, Ramsar International Important Wetlands	2020 (national Important Wetlands), 2023(Ramsar International Important Wetlands).	State Council(2020); “Convention on Wetlands of Importance Especially as Waterfowl Habitat”(2023).

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
4	Hong Kong's Mai Po Reserve	1500	Ramsar International Important Wetlands	1984 (Nature Reserve), 1995 (Ramsar International Important Wetlands).	The former government of the Hong Kong Special Administrative Region (1984), “Convention on Wetlands of Importance Especially as Waterfowl Habitat”(1995).
5	Guangdong Shenzhen Overseas Chinese Town(OCT) National Wetland Park	68.5	National wetland park	2016 (municipal wetland park), 2020(national wetland park).	Shenzhen Municipal Government (2016), National Forestry and Grassland Administration (2020).
6	Guangdong Mayong Huayang Lake National Wetland Park	351.97	National wetland park	2020	National Forestry and Grassland Administration.
7	Cuiheng National Wetland Park, Zhongshan City, Guangdong Province	625.6	National wetland park	2019	National Forestry and Grassland Administration.
8	Hengqin National Wetland Park (Pilot) in Zhuhai, Guangdong	327.4	National wetland park (pilot)	2017	The former State Forestry and Grassland Administration.
9	Qiao-Dangan Island Provincial Nature Reserve, Zhuhai, Guangdong	7373.77	Provincial-level Nature Reserve	2004	National Forestry and Grassland Administration.
10	Zhuhai Miaowan Coral Municipal Nature Reserve	365	Municipal-level nature reserve	2006 (Municipal nature reserve).	Zhuhai Municipal People's Government
11	Guangdong Guangzhou Seagull Island mangrove provincial important wetland	19.44	Provincial-level Important Wetlands	2025	Guangdong Provincial Forestry Bureau
12	Guangzhou	666.66	Provincial-leve	2022	Guangdong Provincial

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
	Nansha coastal wetland, Guangdong Province		l Important Wetlands		Forestry Bureau
13	Guangdong Zhongshan Sanmao Mangrove Provincial important wetland	29.42	Provincial-level Important Wetlands	2024	Guangdong Provincial Forestry Bureau

At present, the estuarine wetland of the Pearl River estuary is threatened by human activities such as land-based pollution input, aquaculture, and urban construction, as well as natural threats such as typhoons, alien species and the invasion of harmful organisms.

（5）Guangdong Dahu Shallow Sea Area Wetland Site

The Guangdong Dahu Shallow Sea Area Wetland Site covers 1,667.88 ha of coastal and estuarine wetlands, including 132.53 ha of estuarine waters, 180.86 ha of subtidal aquatic zones, 93.28 ha of muddy beaches, 1,137.21 ha of shallow waters, and 124 ha of sandy beaches. Guangdong Dahu Shallow Sea Area Wetland Site is part of the Guangdong Haifeng Provincial Nature Reserve for Birds (also known as the Guangdong Haifeng International Important Wetland), featuring a complex and diverse coastal wetland ecosystem with a protected area of 11,590.5 ha. As an important habitat for waterfowl in South China, the reserve is known as the "China Waterfowl Homeland" (Ramsar Information Sheet, 2017). It serves as the habitat for three nationally protected Class I wildlife species (Black-faced Spoonbill *Saundersilarus saundersi*, Relict Gull *Ichthyaetus relictus*, and Little Stork *Platalea minor*, as designated by the National Forestry and Grassland Administration and the Ministry of Agriculture and Rural Affairs in 2021), and also supports 16 other nationally protected Class II wildlife species. The list includes species such as the Chinese Crested Ibis (*Centropus sinensis*), Bengal Ibis (*Centropus bengalensis*), Purple Swamphen (*Porphyrio porphyrio*), White-tailed Stork (*Numenius arquata*), Common Stork (*Arenaria interpres*), Eurasian Sandpiper (*Calidris tenuirostris*), White-rumped Shearwater (*Platalea leucorodia*), Black-winged Kite (*Elanus caeruleus*), Sparrowhawk (*Accipiter virgatus*), Black Kite (*Milvus migrans*),

Grey-faced Buzzard (*Butastur indicus*), Blue-throated Bee-eater (*Merops viridis*), White-breasted Scopsbill (*Halcyon smyrnensis*), Red-footed Falcon (*Falco tinnunculus*), Peregrine Falcon (*Falco peregrinus*), and Oriental Scopsbill (*Garrulax canorus*). Additionally, the Guangdong Haifeng International Important Wetland serves as habitat for 49 bird species (36.30 % of the total) under the China-Japan Migratory Bird Protection Agreement and 24 species (17.78 % of the total) under the China-Australia Migratory Bird Protection Agreement (Guangzhou Linmao Natural Science & Technology Co., Ltd. and Guangdong Haifeng Provincial Nature Reserve Management Office, 2023).

Table 3.4-5 Establishment of protected areas in Guangdong Dahu Site

No.	Name	Wetland area (ha)	Protection status	Year of declaration	Adoption entity
1	Guangdong Haifeng Bird Provincial Nature Reserve	11590.5	Ramsar International Important Wetlands, provincial Bird Nature Reserve.	1998 (Provincial Bird Nature Reserve); 2008 (Ramsar International Important Wetlands).	People's Government of Guangdong Province (1998)；“Convention on Wetlands of Importance Especially as Waterfowl Habitat”(2008).

At present, the Dahu shallow sea area wetland site is threatened by human activities such as ecological landscap fragmentation, pond enclosure, land-based pollution input, as well as natural threats such as typhoons and invasive alien species.

3.5 Status of Supervision and Institutional Development

First, strengthen legislative protection of coastal wetland ecosystems. In December 2021, China enacted its first dedicated law on wetland protection—the *Wetland Protection Law of the People's Republic of China*—which aims to enhance wetland conservation, preserve wetland ecological functions and safeguard biodiversity. Hainan, Guangxi and Guangdong Province have all issued and implemented local wetland protection regulations, including the *Hainan Provincial Wetland Protection Regulations* (November 2023), *Guangxi Zhuang Autonomous Region Wetland Protection Regulations* (November 2014) and *Guangdong Provincial Wetland Protection Regulations* (November 2022). In addition, other local rules concerning habitat protection cover the *Hainan Provincial Regulations on the Protection of Mangroves* (November 2023), *Hainan Provincial Regulations on the Protection of Coral Reefs and Giant Clams* (November 2016), *Guangxi Zhuang Autonomous Region Regulations on the Protection of Mangrove Resources* (September 2018), *Zhanjiang Mangrove Wetland Protection Regulations* (December 2023) and *Zhuhai Special Economic Zone Mangrove Protection Regulations* (December 2023), among others.

Second, gradually improve the construction of the protected area system. In 2019, China issued the *Guidance on Establishing a Protected Area System with National Parks as the Mainstay*. At present, China is building the world's largest national park system (Guangming Daily, 2025), and the development of the protected area system centered on national parks has entered a new stage of systematic integration and comprehensive advancement. Hainan Province has established a protection system with national parks as the mainstay, nature reserves as the foundation, and nature parks as supplements, achieving remarkable results in wildlife habitat protection. Guangxi Zhuang Autonomous Region continues to refine its wetland protection system dominated by wetland-type nature reserves, national wetland parks, and marine parks. Guangdong Province is vigorously advancing protected area development: it added four reserves covering a total of 1,355 hectares between 2008 and 2021, while Hainan Province established the Huangyan Island National Nature Reserve.Currently, the three southern coastal provinces are carrying out the consolidation and optimization of protected areas in accordance with national policies

on protected area development. For instance, Guangxi issued the *Plan for the Consolidation and Optimization of Protected Areas in Guangxi Zhuang Autonomous Region*, and Guangdong released the *Implementation Opinions on Establishing a Protected Area System with National Parks as the Mainstay*.

Third, conduct coordinated planning for the protection and restoration of key ecosystems in offshore and coastal areas. By formulating and gradually implementing key documents including the *Key Projects Plan for Coastal Zone Ecological Protection and Restoration (2021–2035)*, *National Biodiversity Conservation Strategy and Action Plan (2023–2030)*, *Key Projects Plan for the Construction of National Parks and Other Protected Areas and the Protection of Wild Animals and Plants (2021–2035)*, *14th Five-Year Plan Action Plan for Marine Ecological Protection and Restoration*, *Special Action Plan for Mangrove Protection and Restoration (2020–2025)*, and *Special Action Plan for Spartina alterniflora Control (2022–2025)*, China has carried out targeted work such as seagrass protection and restoration, mangrove conservation and rehabilitation, and Spartina alterniflora management through scientific spatial arrangement and context-specific measures.At the provincial level, Guangdong has issued documents like the *Implementation Plan for the Special Action Plan for Mangrove Protection and Restoration of Guangdong Province*, *Guangdong Provincial Biodiversity Conservation Strategy and Action Plan (2023–2030)*, and *Guangdong Provincial Wetland Protection Plan (2023–2035)*. Guangxi has released guidelines including the *Technical Guidelines for Mangrove Afforestation and Restoration of Guangxi (Trial)* and *Technical Guidelines for the Cultivation of Major Mangrove Seedlings in Guangxi (Trial)*. Hainan has promulgated schemes such as the *Implementation Plan for the Special Action Plan for Mangrove Protection and Restoration of Hainan Province (2022–2025)* and *Hainan Provincial Special Plan for Mangrove Resource Protection (2024–2035)*. All these provinces (regions) are advancing the protection and restoration of key offshore and coastal ecosystems in a coordinated and context-adapted manner.

4 Appendix of Governance

4.1 Economic and Policy Drivers

Table 4.1-1 Statistical Data on China's GDP and Poverty Rates from 2000 to 2024

（World Development Indicators, 2025）

Year	GDP			Poverty headcount ratio at national poverty lines (% of population)	Inflation, consumer prices (annual %)
	GDP（Trillion US$）	GDP growth (annual %)	per capita（US$）		
2024	18.744	5.0	13303.1	/	0.2
2023	18.270	5.4	12951.2	/	0.2
2022	18.317	3.1	12970.6	/	2.0
2021	18.202	8.6	12887.4	/	1.0
2020	14.996	2.3	10627.5	0	2.4
2019	14.560	6.1	10342.9	0.6	2.9
2018	14.148	6.8	10085.7	1.7	2.1
2017	12.537	6.9	8979.7	3.1	1.6
2016	11.456	6.8	8254.9	4.5	2.0
2015	11.281	7.0	8175.3	5.7	1.4
2014	10.674	7.5	7781.1	7.2	1.9
2013	9.743	7.8	7147.0	8.5	2.6
2012	8.674	7.9	6405.1	10.2	2.6
2011	7.672	9.5	5703.8	12.7	5.6
2010	6.192	10. 6	4629.2	17.2	3.2
2009	5.189	9.4	3898.2	/	-0.7
2008	4.667	9.7	3523.4	/	5.9
2007	3.604	14.1	2734.7	/	4.8
2006	2.791	12.7	2129.3	/	1.6
2005	2.317	11.5	1777.6	/	1.8
2004	1.984	10.1	1530.9	/	3.8
2003	1.684	10.1	1307.0	/	1.1
2002	1.490	9.2	1163.6	/	-0.7
2001	1.355	8.3	1065.4	/	0.7
2000	1.224	8.6	969.2	/	0.3

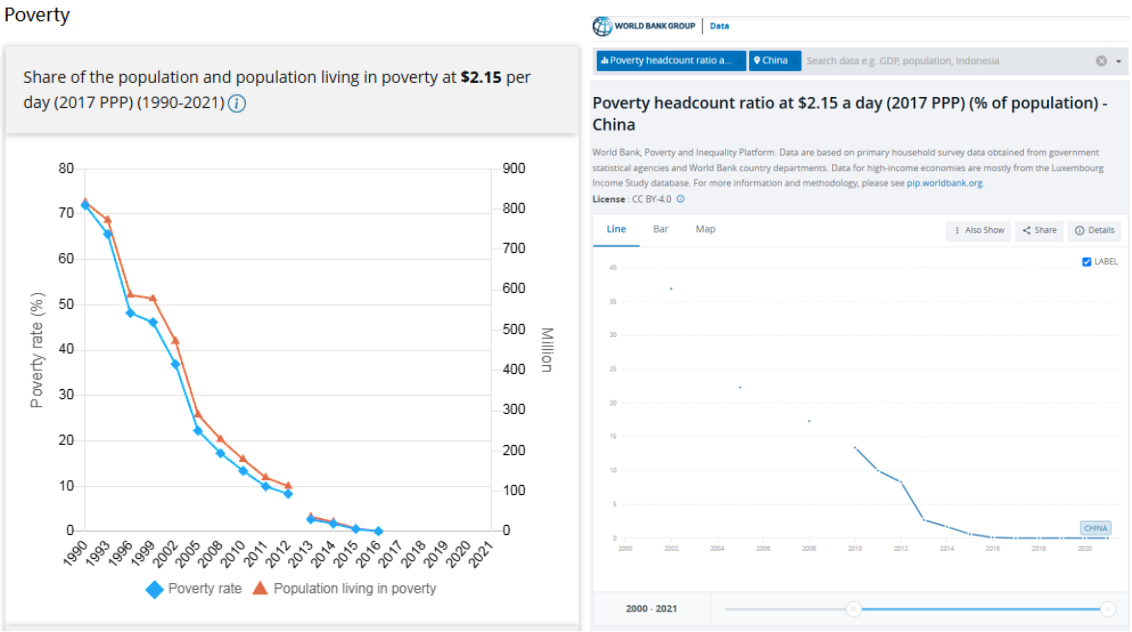

Figure 4.1-1 China's poverty rate data (source: World Bank)

Table 4.1-2 National Ecological Environment Governance Funds (billion CNY)

Year	Ocean GDP (share of national/regional GDP)			
	Nation	Guangdong	Guangxi	Hainan
2024	105438	20022.5	2580.9	2707
2023	99097	19004.3	2440.1	2559.40
2022	94628	18029.1	2294.2	2080.18
2021	90385	17098.1	2230.0	1953.00
2020	80010	15089	1899.0	1800.00
2019	89415	16286.4	1613	1585.00
2018	83415	19315	1454	1599.32
2017	77611	17725	1377	1401.00
2016	70507	15968	1251	1277.50
2015	64669	14443	1098	1144.60

Table 4.1-3 National Ecological Environment Governance Funds

NO.	Name of the Fund	Use of the Fund
1	Funds for marine ecological protection and restoration	Support the protection and restoration of marine ecosystem in key areas
2	Funds for water pollution prevention and control	Support the prevention and control of water pollution and the protection of water ecological environment
3	Key ecological protection, restoration and governance funds	Support ecological protection and restoration
4	Funds for air pollution prevention and control	Supporting air pollution prevention and coordinated response to climate change
5	Funds for soil pollution prevention and control	Support comprehensive prevention and control of soil pollution
6	Funds for rural environmental improvement	Support the protection of rural ecological environment and promote the improvement of rural ecological environment quality

Table 4.1-4 National Fiscal Budget Allocation from 2000 to 2024 (billion CNY)

Year	Total national budget (including central and local governments)	Environmental protection budgetary expenditures and their share
2024	284612.25	5488.63（1.93%）
2023	274622.94	5636.78（2.05%）
2022	260552.12	5412.80（2.08%）
2021	245673.00	5525.14（2.25%）
2020	245679.03	6333.40（2.58%）
2019	238858.37	7390.20（3.09%）
2018	220904.13	6297.61（2.85%）
2017	203085.49	5617.33（2.77%）
2016	187755.21	4734.80（2.52%）
2015	175877.77	4802.89（2.73%）
2014	151785.56	3815.60（2.51%）
2013	140212.10	3435.15（2.45%）
2012	125952.97	2963.46（2.35%）
2011	109247.79	2640.98（2.42%）
2010	89874.16	2441.98（2.72%）
2009	76299.93	1934.04（2.53%）
2008	62592.66	1451.36（2.32%）
2007	49781.35	995.82（2.00%）

Table 4.1-5 Statistical data of GDP in Guangdong Province from 2005 to 2024

Year	GDP		
	GDP (billion CNY)	**annual % of change**	**per capita (CNY)**
2024	141633.8	3.5	111146
2023	137905.4	4.9	108745
2022	132547.1	2.1	104611
2021	127577.4	8.3	100820
2020	113708.9	2.4	90558
2019	110468.1	6.3	88954
2018	101875.9	6.7	83201
2017	93004.8	7.5	77346
2016	83493.4	7.8	70799
2015	75820.8	7.9	65456
2014	69593.4	8.0	61157
2013	63757.3	8.5	57153
2012	58057.6	8.2	53271
2011	54009.6	10.3	50960
2010	46821.3	12.8	45521
2009	40215.7	9.9	40168
2008	37351.5	10.6	38205
2007	32308.5	15.3	33828
2006	26403.1	14.8	28336
2005	22366.1	14.1	24438
2004	18994.0	13.3	21019
2003	16286.6	14.9	18295
2002	13848.6	12.4	15759
2001	12319.2	10.6	14174
2000	10958.4	11.8	12993

Table 4.1-6 Guangdong Province Fiscal Budget Allocation from 2000 to 2024 ((billion CNY))

Year	Total budget	Environmental protection budgetary expenditure
2024	17956.40	/
2023	18527.03	444.65
2022	18533.08	464.89
2021	18247.01	493.55
2020	17430.79	517.76
2019	17297.85	747.44
2018	15729.26	567.41
2017	15037.48	433.23
2016	13446.09	297.45
2015	12827.80	322.33
2014	9152.64	259.04
2013	8411.00	307.78
2012	7387.86	235.44
2011	6712.40	232.62
2010	5421.54	239.16
2009	4334.37	100.80
2008	3778.57	47.09
2007	3159.57	26.71

Table 4.1-7 Statistics of GDP in Guangxi Zhuang Autonomous Region from 2005 to 2024

Year	GDP		
	GDP (billion CNY)	annual % of change	per capita (CNY)
2024	28649.4	4.2	57071
2023	27501.7	4.1	54599
2022	26419.7	2.8	52399
2021	25311.5	7.9	50341
2020	22250.7	3.7	44497
2019	21341.5	6.0	42988
2018	19951.7	6.8	40495
2017	18071.7	7.1	37017
2016	16417.2	7.0	33962
2015	15030.2	8.0	31375
2014	13856.7	8.5	29169
2013	12680.6	10	26908
2012	11496.6	10.1	24594
2011	10472.7	11.4	22607
2010	8712	11.8	18407
2009	7243.4	11.5	14978

Year	GDP		
	GDP (billion CNY)	annual % of change	per capita (CNY)
2008	6561.9	10.3	13694
2007	5556.4	13	11714
2006	4479.8	11.2	9553
2005	3789.5	11.1	7937
2004	3348.9	10.3	6872
2003	2833.6	9.2	5855
2002	2552.8	10.6	5313
2001	2302.8	8.3	4828
2000	2096.7	7.7	4431

Table 4.1-8 Guangxi Zhuang Autonomous Region Fiscal Budget Allocation from 2000 to 2024 ((billion CNY))

Year	Total budget	Environmental protection budgetary expenditure
2024	6485.35	/
2023	6101.37	70.43
2022	5893.32	90.81
2021	5806.54	83.50
2020	6179.47	100.74
2019	5850.96	99.84
2018	5310.74	79.45
2017	4908.55	85.11
2016	4441.70	90.70
2015	4065.51	98.68
2014	3479.79	84.00
2013	3208.67	64.23
2012	2985.23	60.01
2011	2545.28	53.90
2010	2007.59	63.99
2009	1621.82	49.92
2008	1297.11	27.97
2007	985.94	14.10

Table 4.1-9 Statistics of GDP in Hainan Province from 2005 to 2024

Year	GDP		
	GDP (billion CNY)	annual % of change	per capita (CNY)
2024	7935.7	3.7	75903
2023	7590.2	9.2	73335
2022	6912.8	0.4	67541
2021	6508.9	11.4	64063
2020	5640.8	3.6	56211
2019	5442.1	5.9	55054
2018	5004.2	6.0	51220
2017	4552.9	6.9	47205
2016	4151	7.7	43648
2015	3782.7	7.6	40220
2014	3541.2	8.8	38159
2013	3201.9	9.7	34993
2012	2863.6	9.4	31818
2011	2525.1	12.2	28711
2010	2073.7	16.1	23932
2009	1652.2	11.8	19234
2008	1502	10.5	17681
2007	1252.8	15.7	14905
2006	1040.3	10.6	12504
2005	896.1	10.5	10888
2004	813.1	9.7	9983
2003	722.6	10.7	8954
2002	650.0	9.6	8130
2001	585.3	9.0	7391
2000	532.0	9.1	6864

Table 4.1-10 Hainan Province Fiscal Budget Allocation from 2000 to 2024 (billion CNY)

Year	Total budget	Environmental protection budgetary expenditure
2024	2293.57	/
2023	2248.96	44.52

Year	Total budget	Environmental protection budgetary expenditure
2022	2097.37	50.73
2021	1971.37	50.55
2020	1972.46	57.84
2019	1858.60	64.98
2018	1691.30	61.24
2017	1443.97	35.72
2016	1376.48	37.31
2015	1239.43	31.54
2014	1099.74	23.28
2013	1011.17	23.18
2012	911.67	21.23
2011	778.80	23.97
2010	581.34	14.89
2009	486.06	18.51
2008	357.97	6.81
2007	245.20	5.32

Source data indicator 6.5.1 Degree of integrated water resources management implementation (0-100)

Country (or area), regional and world data for the latest year of reporting: 2020 - 2023

Country (or area), region, world	Year	6.5.1 Degree of integrated water resources management implementation (0-100)				
		Overall	Enabling environment	Institutions and participation	Management instruments	Financing
Cameroon	2023	49	40	65	49	40
Canada	2023	73	79	70	70	72
Central African Republic	2023	44	61	55	27	33
Central and Southern Asia	2023	55	56	56	56	50
Chad	2023	38	40	38	44	30
Chile	2023	26	29	26	32	18
China	2023	81	84	79	82	78
Colombia	2023	41	51	46	33	32
Comoros	2023	25	35	30	31	4
Congo	2023	48	53	51	48	38
Costa Rica	2023	51	49	57	59	40

Figure 4.1-2 Implementation level of water resources management

4.2 Institutional setting

Table 4.2-1 Institutions and duties and functions related to governance

Institute	Linkages to Marine Governance	Legal Foundation
Ministry of Ecology and Environment of the People's Republic of China	（1）Coordinate the protection of marine ecological environment and be responsible for the supervision and management of marine environmental pollution prevention and control; （2）Take the leading role in marine ecological environment monitoring，formulate monitoring systems and regulations for marine ecological environment, draft relevant standards, and supervise their implementation; （3）Take the leading role in work related to climate change; （4）Take the leading role in supervising and legally enforcing laws pertaining to the ecological environment.	Regulations on the Functional Configuration, Internal Institutions, and Staffing of the Ministry of Ecology and Environment
Ministry of Natural Resources of the People's Republic of China	（1）Take the leading role in the investigation, monitoring, and evaluation of natural resources such as oceans; （2）Take the leading role in establishing a spatial planning system and supervising its implementation; （3）Take the leading role in marine ecology, coastal restoration, and island restoration work; （4）Take the leading role in the supervision and management of ocean development, utilization, and protection. Responsible for managing the use of sea areas and the protection and utilization of islands.	Regulations on the Functional Configuration, Internal Institutions, and Staffing of the Ministry of Natural Resources

Ministry of Agriculture and Rural Affairs of the People's Republic of China	（1）Take the leading role in the supervision and management of fisheries, bilateral and multilateral fisheries negotiations and compliance work, and the management of offshore fisheries and the supervision and management of fishery administration and fishing ports. （2）Guide the protection and management of biological species resources in fishery waters.	Regulations on the Functional Configuration, Internal Institutions, and Staffing of the Ministry of Agriculture and Rural Affairs
Ministry of Transport of the People's Republic of China	（1）Take the leading role in the supervision and management of marine environmental pollution caused by non military vessels within the jurisdiction of the port area and non fishing and non military vessels outside the port area, organizing, coordinating, and commanding emergency response to major oil spills at sea.	Marine Environmental Protection Law of the People's Republic of China
National Forestry and Grassland Administration	（1）Take the leading role in wetland ecological protection and restoration work; （2）Take the leading role in supervising and managing nature reserves; （3）Take the leading role in biodiversity conservation related work.	Decision of the Standing Committee of the National People's Congress on the Exercise of Maritime Rights Protection and Law Enforcement Powers by the China Coast Guard

Table 4.2-2 Legal and institutional mapping, and stakeholders related to coastal and marine management in the South China Sea and Gulf of Thailand

Legal and institutional mapping, and stakeholders related to coastal and marine management in the South China Sea and Gulf of Thailand							
Institution	**Fisheries & Livelihoods**	**Ecosystem Based Assessment / Marine Park Planning**	**Habitat**	**Pollution /Nutrients**	**Endangered Species**	**Climate Change**	**Qualitative Observations (e.g., lateral, vertical linkages, complete policy cycle in place, signs of improvement (e.g. ecosystem pressures decrease and ecosystem states improved), compliance actions, well equipped and capacity)**
Ministry of Ecology and Environment of the People's Republic of China		V	V	V	V	V	Establish a comprehensive management system that coordinates efforts across coastal, river basin, and marine areas, and formulate and implement the "Marine Ecological Environment Protection Plan" and the "Action Plan for Key Marine Area Comprehensive Management Campaign," among others. Carry out pollution control with a land-sea integrated approach, and ensure the achievement of objectives through regular scheduling and evaluation. In 2023, the proportion of nearshore waters with average annual good water quality in Guangdong, Guangxi, and Hainan reached 92.3%, 94.5%, and 99.66%, respectively, showing an overall steady and improving trend.
Ministry of		V	V		V	V	From 2016 to 2023, the central government lent financial

Legal and institutional mapping, and stakeholders related to coastal and marine management in the South China Sea and Gulf of Thailand							
Natural Resources of the People's Republic of China							support to coastal cities in implementing 175 major marine eco-environmental conservation and restoration projects, including the Blue Bay environmental improvement initiative, the ecological restoration campaign in the comprehensive management, the coastal zone protection and restoration project, and a special action for mangrove conservation and restoration. These projects involved 11 coastal provincial-level administrative units and received a total investment of RMB25.258 billion from the central budget, ultimately leading to the improvement and restoration of nearly 1,680 kilometers of coastline and over 50,000 ha of coastal wetlands nationwide. China also published the Special Action Plan for the Conservation and Restoration of Mangrove Forests (2020-2025) and, by the end of 2023, had built approximately 7,000 ha of mangrove forests nationwide and restored approximately 5,600 ha.
Ministry of Agriculture and Rural Affairs of	V		V		V		Since launching its summer fishing moratorium in 1995, China has extended the duration and scope of the ban over the years and exercised effective control over fishing intensity in

the People's Republic of China							order to conserve and restore fishery resources and promote the sustainable and healthy development of the fishery industry. Since 2003, China has implemented the aggregate management of marine fishery resources, a fishing licensing system, and dual control over the number and engine power of marine fishing vessels, as well as species-based and region-specific fishing quota management. From 2018 to 2023, China's offshore fishing production remained stable at around 9.5 million tons. The catch volumes of major economic fish species such as hairtail, anchovy, and swimming crab remained steady, while the catches of Spanish mackerel, pomfret, and squid showed a moderate increase. Additionally, the populations of valuable and endangered aquatic wild animals, including the Chinese white dolphin, spotted seal, and sea turtle, have also shown a positive trend.
Ministry of Transport of the People's Republic of China				V			To comply with the Water Pollutant Discharge Standards for Vessels, China has launched special actions to address water pollution from vessels, and makes sure that environment-friendly standards have been included in shipbuilding technology laws and regulations.

							The country has strengthened joint regulation of the transfer and disposal of water pollutants from vessels, and coastal provinces and equivalent administrative units have completed the construction of basic vessel pollutant receiving, transfer, and disposal facilities.
National Forestry and Grassland Administration		V	V		V	V	In its marine protected areas system China includes important marine ecosystems, and natural areas with concentrations of rare and endangered marine species and natural relics and landscapes, and provides them with special protection. Over the years, the country has established 352 marine protected areas, which protect about 93,300 sq km of sea areas. These areas focus on the protection of rare and endangered marine species such as the Chinese white dolphin, typical ecosystems such as mangrove forests and coral reefs. The marine protected areas have enabled the populations of rare marine species to recover gradually. Issue and implement the "National Nature Reserve Ecological Environment Protection Effectiveness Evaluation Work Program (2022-2026)", and continue carry out the "Green Shield" Nature Reserve Strengthening Supervision.

4.3 Legal and policy setting

Table 4.3-1 International Legal and policy setting

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
1	UN Convention on the Law of the Sea	V	V	V		China was among the first to sign the Convention in December 1982 and ratified it in 1996, strongly promoting the conclusion and entry into force of the Convention. In accordance with the provisions and spirit of the Convention, China has successively enacted the Territorial Sea and Contiguous Zone Law and the Exclusive Economic Zone and Continental Shelf Law. Important marine-related laws, such as the Marine Environmental Protection Law, Fisheries Law, and Law on the Administration of the Use of Sea Areas, have been introduced to strengthen marine environmental protection and resource

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						conservation. China has also promulgated the Deep Sea Bed Resource Exploration and Development Law, enacted the Coast Guard Law, and revised the Maritime Traffic Safety Law, continuously improving a marine legislation system that aligns with international law, including the Convention.
2	Basel Convention		V			China signed the treaty on March 22, 1990, and it officially came into effect on May 5, 1992. The signing of the Basel Convention promoted the enactment of the "Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste." In addition, the first edition of the National Hazardous Waste List was basically compiled

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						based on Annex I of the Basel Convention, accompanied by the development of the "Standards for the Identification of Hazardous Wastes." A series of laws and regulations were formulated and enacted, including the "Administrative Measures for Hazardous Waste Business Permits," the "Regulations on the Management of Medical Waste," and the "Regulations on the Recovery and Disposal of Waste Electrical and Electronic Products," along with their corresponding pollution control standards.
3	CITES	V				China decided to join the Convention on December 25, 1980, and the Convention came into effect for China on April 8, 1981. China has

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						established a compliance legislative system centered on the "Wildlife Protection Law," the "Regulations on the Protection of Wild Plants," and the "Regulations on the Administration of Import and Export of Endangered Species of Wild Fauna and Flora," which was rated at the highest level in the domestic legislation review organized by the CITES Secretariat. In 1982, China established the Scientific Committee on Endangered Species of the People's Republic of China as the scientific body for compliance, and the Office of Import and Export Administration for Endangered Species of the People's Republic of China as the management body for compliance. A cross-departmental coordination

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						working group for compliance enforcement was established to continuously strengthen law enforcement efforts, effectively combat smuggling crimes, and actively participate in relevant international cooperation.
4	Ramsar Convention	V				China decided to accede to the Convention on January 3, 1992, and the Convention came into effect in China on July 31, 1992. Since joining the Convention, China has successively issued policy and legal documents such as the "Notice on Strengthening Wetland Protection and Management," the "National Wetland Protection Project Plan (2002-2030)," and the "Wetland Protection Law." China has established an interdepartmental National Compliance

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						Committee, strengthened the protection and management of wetland ecosystems—including 82 internationally important wetlands and over 600 wetland nature reserves—and actively participated in international cooperation.
5	UN Framework Convention on Climate Change				V	China approved the Convention on November 7, 1992, and deposited the instrument of ratification with the Secretary-General of the United Nations on January 5, 1993. The Convention came into force for China on March 21, 1994. The "Opinions on the Comprehensive, Accurate and Thorough Implementation of the New Development Concept to Do a Good Job in Carbon Peak Carbon Neutralization Work", the "Action Plan for Carbon Peak before 2030", the

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						"Interim Regulations on the Management of Carbon Emissions Trading" the "Opinions on Promoting Green and Low Carbon Transformation Strengthening the Construction of the National Carbon Market" were issued. Since 2021, the national carbon emissions trading market has been launched. It is the largest market in the world in terms of emissions coverage. In 2024, the national voluntary reduction trading market for greenhouse gases was launched, which provides real financial support for projects the function of reducing carbon and increasing carbon sinks, and helps promote the value realization of ecological products. On November 3, 2025, China officially

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						submitted the "2035 China National Contribution Support Report" to the secretariat of the United Nations Framework Convention on Climate Change.
6	Kyoto Protocol				V	China signed the Protocol on May 29, 1998, and ratified it on August 30, 2002. The Protocol came into effect for China on February 16, 2005.
7	Paris Agreement				V	China signed the Paris Agreement on April 22, 2016, ratified it on September 3, 2016, and on November 4, 2016, the Paris Agreement officially came into effect.
8	Stockholm Convention		V			China signed the Convention on May 23, 2001. The Convention officially came into effect in China on November 11, 2004. China has formulated a national implementation plan and

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						its supplementary versions, issued the "Action Plan for the Management of New Pollutants," established a compliance coordination mechanism, and continuously improved the POPs control system. Strict environmental access for construction projects is enforced, green alternatives for pesticides and industrial POPs are promoted, coordinated emission reductions in key industry sectors are strengthened, and green development in industries is actively advanced. Efforts are also being made to enhance the legal framework for POPs control, deepen waste management and disposal, strengthen technological support, and continuously improve POPs control capabilities.

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
9	Montreal Protocol				V	In 1991, China acceded to the Protocol and subsequently adopted all amendments under its framework. At the national, inter-ministerial, and departmental levels, specialized compliance institutions were established, including the National Leading Group for the Protection of the Ozone Layer, the National Office for the Administration of Import and Export of Ozone-Depleting Substances, and the Protocol Compliance Coordination Working Group. Efforts were made to promote the enactment of the Regulations on the Administration of Ozone-Depleting Substances. In accordance with the requirements and progress of Protocol compliance, over one hundred normative

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
						documents and management policies were issued to facilitate comprehensive management of various ODS across their different applications, ensuring the achievement of Protocol compliance objectives and sustainable compliance.
10	COBSEA	V	V			China is one of the founding members of the Cooperation on Oceanian Biodiversity in Southeast Asia (COBSEA), and has been involved its establishment in 1994. COBSEA focuses on the protection of marine environments and coastal ecosystems in the East Asian region, and China participates in regional ocean in depth through policy coordination, technical cooperation and financial support.

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
11	Plan of Action to Implement the ASEAN-China Comprehensive Strategic Partnership (2026-2030)	V	V		V	China established a dialogue relationship with ASEAN in 1991, a strategic partnership for peace and prosperity in 2003, and comprehensive strategic partnership in November 2021. The two sides also signed the China-ASEAN Comprehensive Strategic Partnership Action Plan (2026-2030).
12	Partnerships in environmental management for the seas of east Asia (PEMSEA)	V	V			In 1993 , China actively participated in the establishment of a regional GEF/UNDP/IMO project on Marine Pollution Prevention in theEast Asian Seas (MPP-EAS) alongside representatives fromIMO,UNDP,Cambodia, Philippines, Thailand and Viet Nam, theagreement of which was signed in Xiamen, China.

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues				
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change	Qualitative Observations (E.g., lateral and/or vertical linkages, complete policy cycle in place, signs of improvement (ecosystem pressures decrease and ecosystem states, social justice and well being improved), compliance actions, well equipped and capacity developed, benefit sharing.)
13	Declaration on the Conduct of Parties in the South China Sea		V			November 4, 2002, signed by the Government of the People's Republic of China and the governments of the ASEAN member countries Phnom Penh, Kingdom of Cambodia.

Table 4.3-2 National Legal and policy setting

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues			
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change
A.	Laws and Regulations				
1	Environmental Protection Law	V	V		
2	Marine Environmental Protection Law	V	V	V	
3	Solid Waste Pollution Prevention and Control Law		V		
4	Wetland Protection Law	V			
5	Fisheries Law			V	
6	Environmental Impact Assessment Law	V	V		
7	Water Law		V		
8	Water Pollution Prevention and Control Law		V		
9	China Coast Guard Law	V	V	V	
10	Regulations on the Administration of Marine Dumping		V		
11	Regulations on Nature Reserves	V	V	V	
12	Standing Committee of the National People's Congress Resolution on Actively Responding to Climate Change				V
13	Regulations of Guangdong Province on Ecological and Environmental Protection	V	V		
14	Regulations of the Guangxi Zhuang Autonomous Region on Marine	V	V		

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues			
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change
	Environmental Protection				
15	Regulations of the Guangxi Zhuang Autonomous Region on the Protection of Mangrove Resources	V			
16	Regulations of Hainan Province on Wetland Protection	V			
17	Provisions of Hainan Province on Mangrove Protection	V			
	Plans and Action Plans				
1	Plan for Ecological and Environmental Protection during the 14th Five-Year Plan Period	V	V		
2	Plan for Marine Ecological and Environmental Protection during the 14th Five-Year Plan Period	V	V		V
3	National Plan for Main Functional Zones of the Ocean	V			
4	Plan for Major Projects of Ecological Protection and Restoration of Coastal Zones (2021-2035)	V			
5	Special Action Plan for Mangrove Protection and Restoration (2020-2025)	V			
6	Water Pollution Prevention and Control Action Plan		V		
7	Campaign Action Plan for Comprehensive Governance of Key Marine Areas	V	V		
8	Plan for Ecological and Environmental Protection of Guangdong Province	V	V		V

Number	International Conventions, Regional Agreements,Transboundary Agreements, Laws And Regulation, Plans and Action Plans	Regulation Group Based on Issues			
		Biological Resources and Ecosystems	Pollution	Fisheries	Climate Change
	during the 14th Five-Year Plan Period				
9	Plan for Marine Ecological and Environmental Protection of Guangdong Province during the 14th Five-Year Plan Period	V	V		
10	Plan for Ecological and Environmental Protection of Guangxi during the 14th Five-Year Plan Period	V	V		V
11	14th Five-Year Plan for High-Quality Development of Marine Ecological and Environmental Protection in the Guangxi Zhuang Autonomous Region	V	V		
12	Plan for Ecological and Environmental Protection of Hainan Province during the 14th Five-Year Plan Period	V	V		V
13	Plan for Marine Ecological and Environmental Protection of Hainan Province during the 14th Five-Year Plan Period	V	V		

4.4 Civil society, stakeholders and participation

Table 4.4-1 NGOs and Special Interest Groups

NO	Partner Institutions
1	IUCN
2	WWF
3	TNC
4	CBCGDF(China Biodiversity Conservation and Green Development Foundation)
5	CHINA OCEANIC DEVELOPMENT FOUNDATION
6	CEPF (China Environmental Protection Foundation)
7	SEE FOUNDATION
8	The Paradise International Foundation
9	China Ecological Civilization Research and Promotion Association，CECRPA
10	Chinese Society for Environmental Sciences
11	South China Institute of Environmental Sciences, Ministry of Ecology and Environment
12	National Marine Environment Monitoring Center
13	Third Institute of Oceanography, Ministry of Natural Resources
14	Fourth Institute of Oceanography, Ministry of Natural Resources
15	South China Sea Ecological Center, Ministry of Natural Resources
16	South China Sea Survey Center of the Ministry of Natural Resources
17	South China Sea Development Research Institute, Ministry of Natural Resources
18	South China Sea Institute of Oceanology, Chinese Academy of Sciences
19	South China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences
20	Guangdong Ocean University
21	Sun Yat-sen University
22	South China Agricultural University
23	Shantou University
24	Shenzhen University
25	Southern University of Science and Technology
26	Guangxi University
27	Guangxi University for Nationalities
28	Beibu Gulf University
29	Hainan University
30	Hainan Tropical Ocean University